– – OHDSI

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2025-02-21

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23.11□□□□□□□□□□□□□□□□□□□□dCCB□□□□ 240
23.12□□□□□□□□□□□□□□□□□□□□□ndCCB□□□□ 240
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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
Paola Saroufim	Martijn Schuemie	Sarah Seager
Anthony Sena	Sunah Song	Matt Spotnitz
Marc Suchard	Joel Swerdel	Devin Tian
Don Torok	Kees van Bochove	Mui Van Zandt
Erica Voss	Kristin Waite	Mike Warfe
Jamie Weaver	James Wiggins	Andrew Williams
Seng Chan You		

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Table 1: □□□□

Part I

OHDSI

Chapter 1

– – OHDSI

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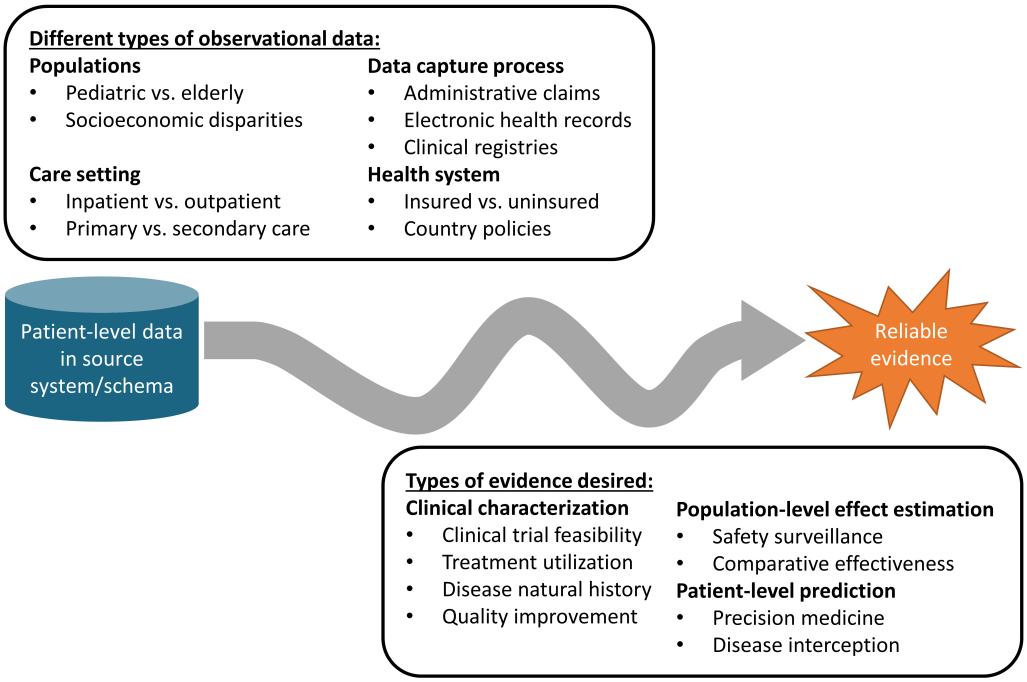

Figure 1.1: □□□□□□□□□□□□□□□

1.2.1

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1.3 OHDSI

OHDSI□2014□□□

1.4 OHDSI

OHDSI□□OHDSI□□□□□□□□□□□□□□□□□□□

Chapter 2

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Chapter 3

2.1

OHDSI□□□

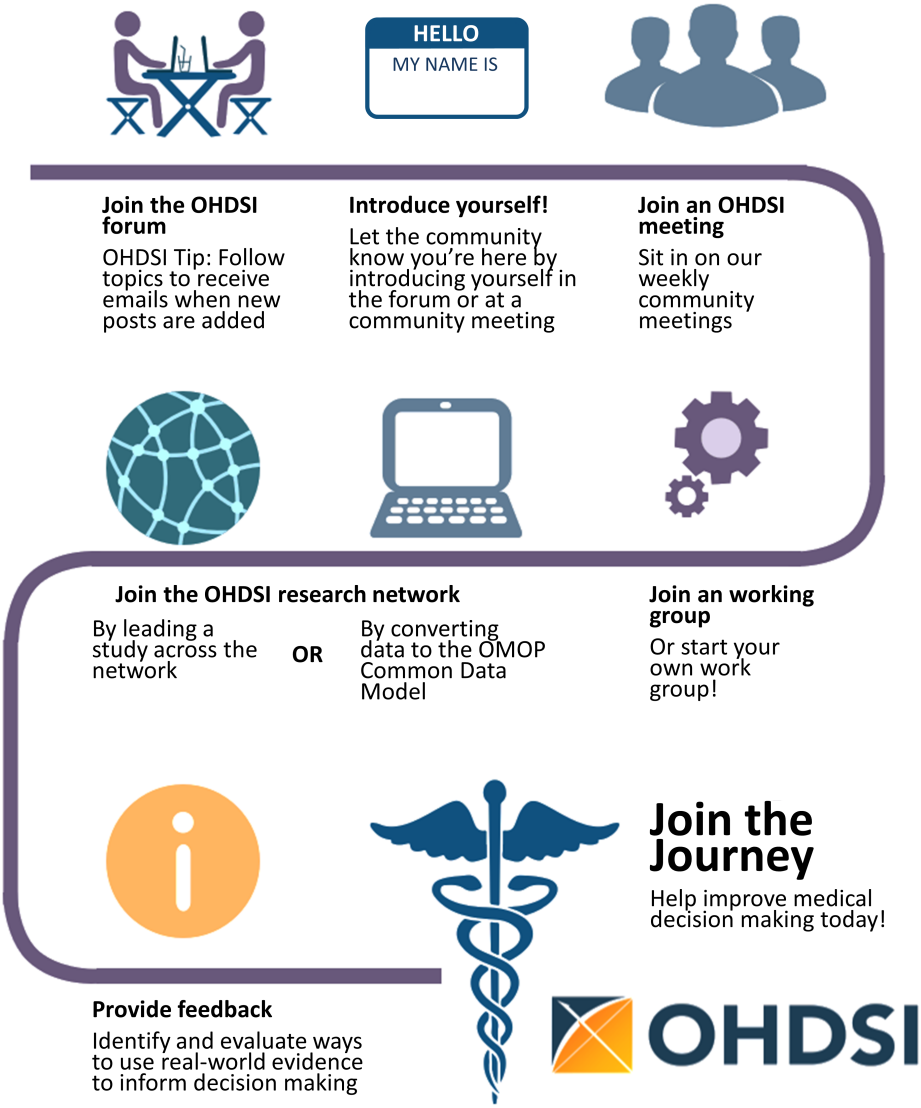

Figure 3.1: □□□□□□□□ - OHDSI□□□□□□□□□□□□□□□□

OHDSI□□□

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Clinical Trials	OHDSI□□□□□□□□

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CDM□□□□□□□□□□□□□□□□□□□

Chapter 4

— —

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OHDSI□□□□□□□□□□□

4.3

OHDSI□□OMOP□□□□□□□□□□Chapter 5□□□□□□□□□□□□□□□□Chapter 6□□□□□□□□□□□□□□□□□□□

4.7.4

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

Chapter 5

□□□: *Clair Blacketer*

□□□

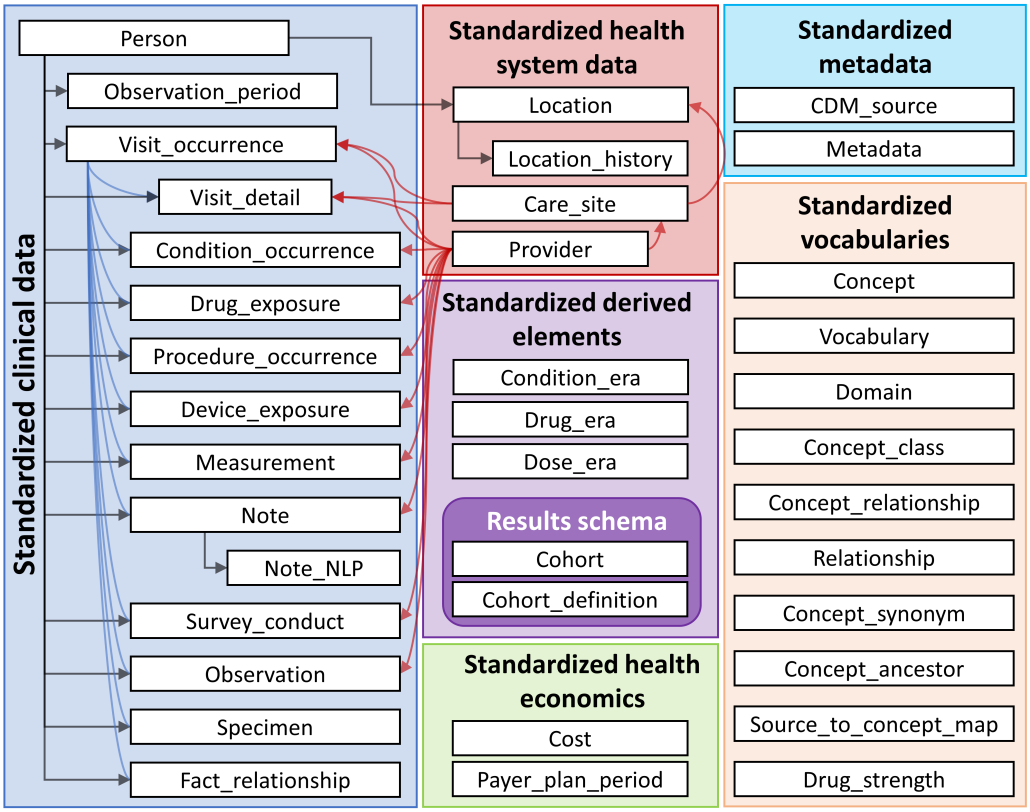

Figure 5.1: CDM□□□□□6.0□□□□□□□

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□□□□□□	□□□□ID	□□□□□□	□□□□ID
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

5.1.5

CDM□□□□□□□

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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 5.3: □□□□SNOMED□□□

5.1.8 Running Example:

□□□□□□□

Table 5.3: 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 5.5: OBSERVATION_PERIOD□□□□□

□□	□	□□
OBSERVATION_ PERIOD_ID	1	□□□□□□□□□□□□□□□□□□□□

□□	□	□□
VISIT_TYPE_CONCEPT_ID	32034	□□□□□□□□□□□□□□□□□□□□□□□□□□□EHR□
PROVIDER_ID	NULL	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
CARE_SITE_ID	NULL	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
VISIT_SOURCE_VALUE	□□	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
VISIT_SOURCE_CONCEPT_ID	NULL	□□□□□□□□□□OHDSI□□□□□□□□□□□□□□□□□□□
ADMITTED_FROM_CONCEPT_ID	NULL	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ 8536□□□□□□□□□□□□
ADMITTED_FROM_SOURCE_CONCEPT_ID	NULL	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
DISCHARGE_TO_CONCEPT_ID	NULL	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ 8615□□□□□□□□□□□□□□□□
DISCHARGE_TO_SOURCE_VALUE	NULL	□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□ living facility□□□□
PRECEDING_VIS		

IT_OCCURRENCE_ID|NULL|□□□□□□□□□□□□□□□□□□□ADMITTED_FROM_CONCEPT

- □□□1□□□□□□□□□□□□□□□□□□□

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

□□□□

□□□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□□□□□□□□□□□□□□□□□□□

Chapter 6

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

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

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 6.1: 1660□□□□□

6.1.2

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6.1.3 :

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OMOP CDM□□□□□□□□□□□□□□□□□□□

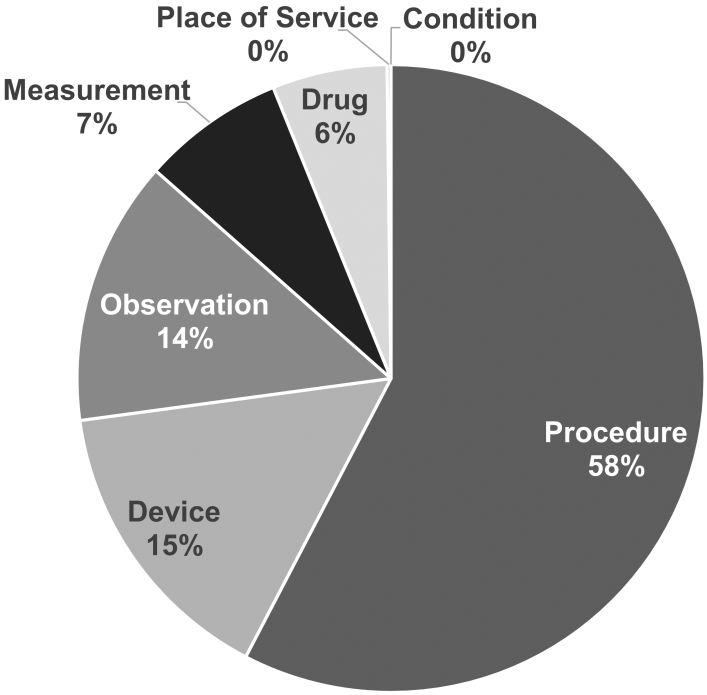

Figure 6.3: □□□□□CPT4□□□HCPCS□□□□□

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□□	RxNorm, RxNorm Extension, CVX	HCPCS, CPT4, HemOnc, NAACCR	ATC
□□	SNOMED	□□□□□□□□□□□□□□□□□□□□□□□□□□□□	
□□	SNOMED	□□□□	□□□□□□□
□□	CMS Place of Service, ABMT, NUCC	SNOMED, HCPCS, CPT4, UB04	□□□□□□□

6.1.12

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Table 6.5: □□□□Finding site of□□□□□□□□□□□□□□□□□□□

6.2

DOMAIN_ID□VOCABULARY_ID□CONCEPT_CLASS_ID□□□□CONCEPT□□□□□□□□□□CON
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6.3

6.3.1

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6.4

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Chapter 7

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□□□□□□□□: *Clair Blacketer & Erica Voss*

7.1

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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 7.3: □□□□□□□□□□□□□□□□□□□□

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

Figure 7.4: □□□□□□□□□□□

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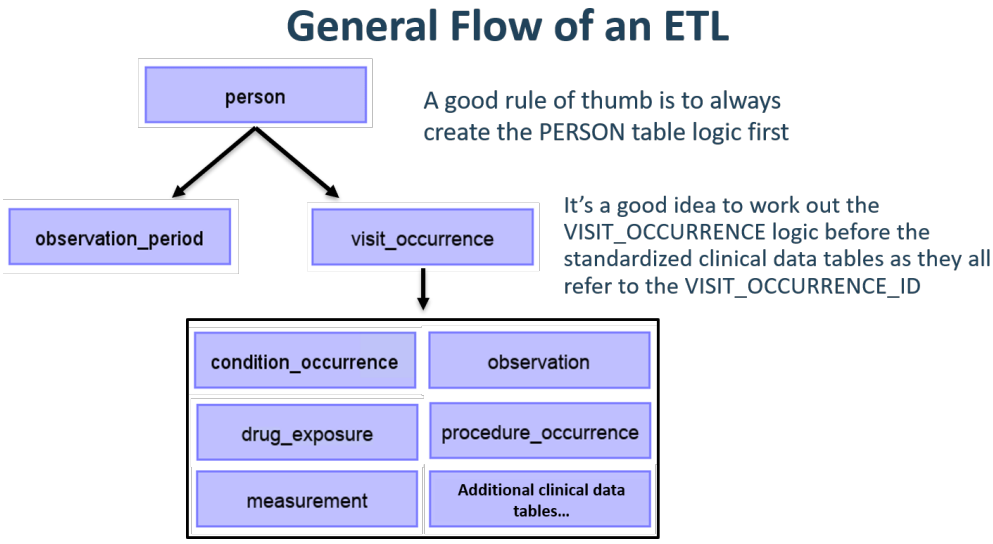

Figure 7.5: ETL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

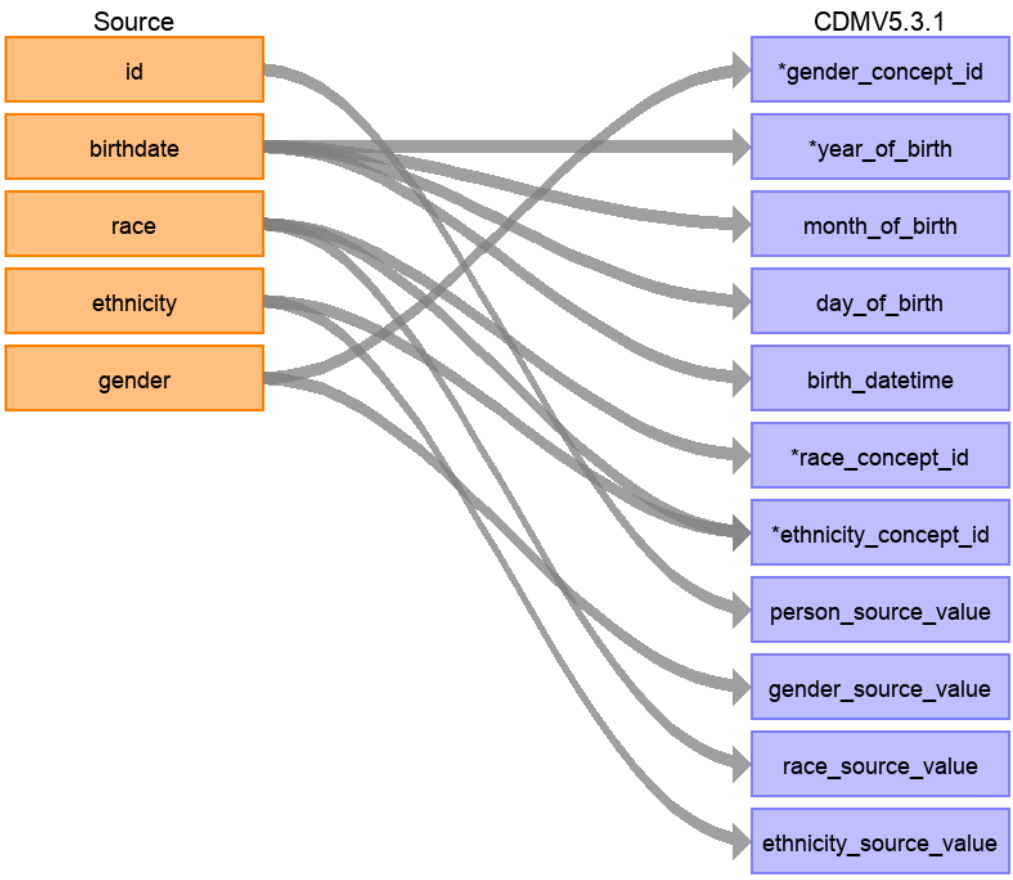

Figure 7.6: Synthea Patients□□□□□□□CDM PERSON□□□□□□□□□□□□□□

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

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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	□□□□□□□□□

□□ **7.3.** 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 7.8: □□□□□□□□□□

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Chapter 8

□□□□□□□□: *David Madigan*

OHDSI□□□□□□□□

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8.3

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8.4.2

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Chapter 9

– – OHDSI

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

OHDSI□□□□□

Library□□□□□

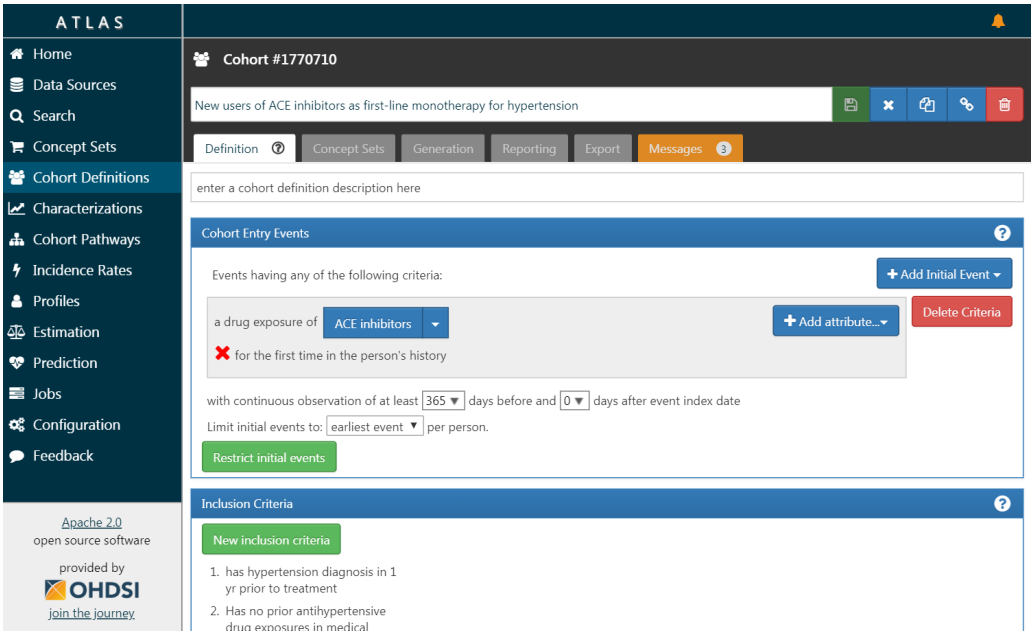

Figure 9.3: ATLAS□□□□□□□□□□□

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9.2.3

ATLAS□□□□□□□□□□OHDSI WebAPI□□□□□□□□□□

Figure 9.4: Packages in the OHDSI Methods Library.

9.3.4

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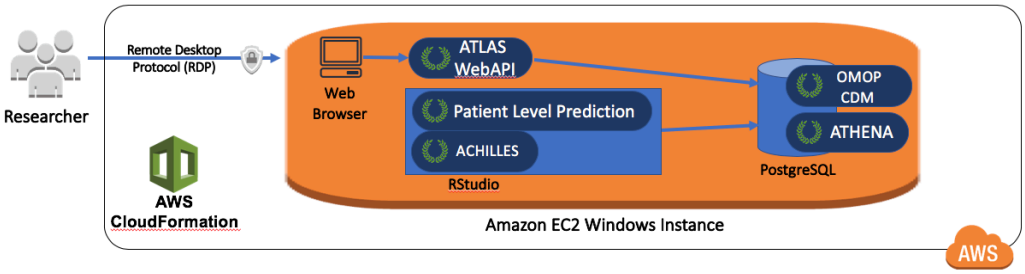

Figure 9.5: OHDSI-in-a-Box□Amazon Web Services□□□□□□□□

OHDSIonAWS□□□□□□□□

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  - □□□□□□□□□□□□□□□□□□□□□ATLAS
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Chapter 10

– – SQL R

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

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```
install.packages("SqlRender")
```

SqlRender□□□□□□□□□□□□□□□□□□PostgreSQL□Microsoft SQL Server□SQLite□Oracle□□□□□
APS□IBM Netezza□Amazon Redshift□□□□□□□□□□□□□□□□□□□□□□□Impala□□□Hadoop□Goo
BigQuery□□□□□□□□□□□□□□□□R□□□□□□□□□□□□□□□□□□□

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

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

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

□□□□□□□□□□□□□□□□□□

```
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;"
```

10.0.2 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□□□□□□□□□□□□□□□□□□□

Translate□□□□□□□□□□□□

□□□□SQL Server□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□: supported by translate

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ABS	EXP	RAND
ACOS	FLOOR	RANK
ASIN	GETDATE	RIGHT
ATAN	HASHBYTES*	ROUND
AVG	ISNULL	ROW_NUMBER
CAST	ISNUMERIC	RTRIM
CEILING	LEFT	SIN
CHARINDEX	LEN	SQRT
CONCAT	LOG	SQUARE
COS	LOG10	STDEV
COUNT	LOWER	SUM
COUNT_BIG	LTRIM	TAN
DATEADD	MAX	UPPER
DATEDIFF	MIN	VAR
DATEFROMPARTS	MONTH	YEAR
DATETIMEFROMPARTS	NEWID	
DAY	PI	
EOMONTH	POWER	

* Oracle□□□□□□□□□□□□□□□SQLite□□□□□□□□□□□□□□□

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```sql
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;
```

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□□□□□□□□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□□□□□□□□□□□□□□□□□□□□□□□□□□□□ `SELECT first_name + last_name AS full_name FROM table` □□□□□□□□SqlRender□2□ `last_name + CAST(age AS VARCHAR(3)) AS full_name FROM table` □□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□AS□□□□□□

□□□SQL□□□□□□□□□□□□□□□□□□□□□□□□□□ AS □□□□□□□□□□□□□□□□□□□□

□□□□Oracle□□□□

```
SELECT * FROM @databaseSchema.person
```

SQL Server□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□databaseSchema = "cdm_data.dbo"□□□□□□□□□□□□□□□□□□□

```
## Connecting using PostgreSQL driver
```

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10.0.5 ffdf

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NUM_YEARS
1.980803

□□□

```
                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
```

□□□□□□□□□□□□□□□□□□□

CONDITION_SOURCE_VALUE	CODE_COUNT
496	19570098
I10	19453451
3180	18973883

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

10.1

□□□CDM□□□□□□□□SQL□□□□□□□□

```
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

□□□□□□□□□□□□□□□□□□□

10.2 QueryLibrary

QueryLibrary□□CDM□□□□□□□SQL□□□□□□□

10.3.3

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10.3.4

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SQL□R□□□□□□□□□□□

OHDSI□□OHDSI□□□□

```
library(DatabaseConnector)
conn <- connect(dbms = "postgresql",
                server = "localhost/postgres",
                user = "joe",
                password = "secret")
cdmDbSchema <- "cdm"
cohortDbSchema <- "scratch"
cohortTable <- "my_cohorts"

sql <- "
CREATE TABLE @cohort_db_schema.@cohort_table (
  cohort_definition_id INT,
  cohort_start_date DATE,
  cohort_end_date DATE,
  subject_id BIGINT
);
"
renderTranslateExecuteSql(conn, sql,
                          cohort_db_schema = cohortDbSchema,
                          cohort_table = cohortTable)
```

□□□□□□□□□□□□□□□□□□□

```
  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

10.3.6

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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□□□□□□□□□□□□□

10.3.7

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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_END

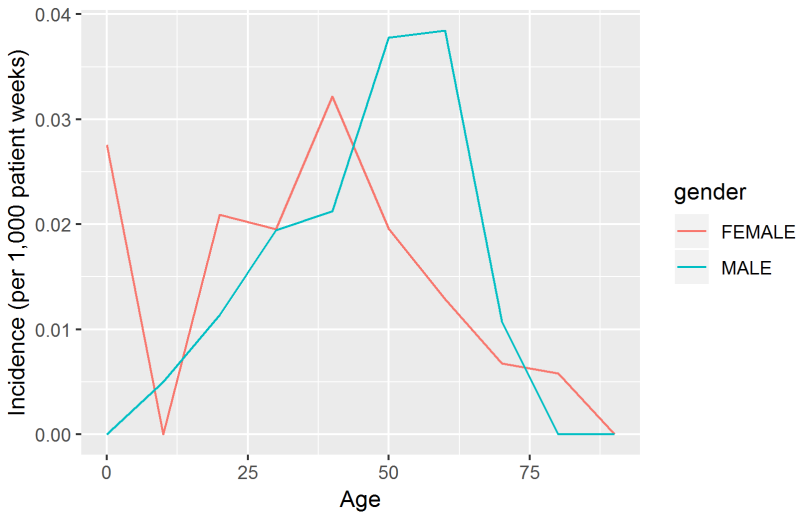
SQL□□□□□□□□□□□□□□□□□□□□□□□□□□□□SQL□□□□□□□□□□□□□□□□□□□□□R□□□□□□□□

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     ")
```



10.3.8

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10.4

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

Chapter 11

— —

□□□□□: *Kristin Kostka!*

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11.2

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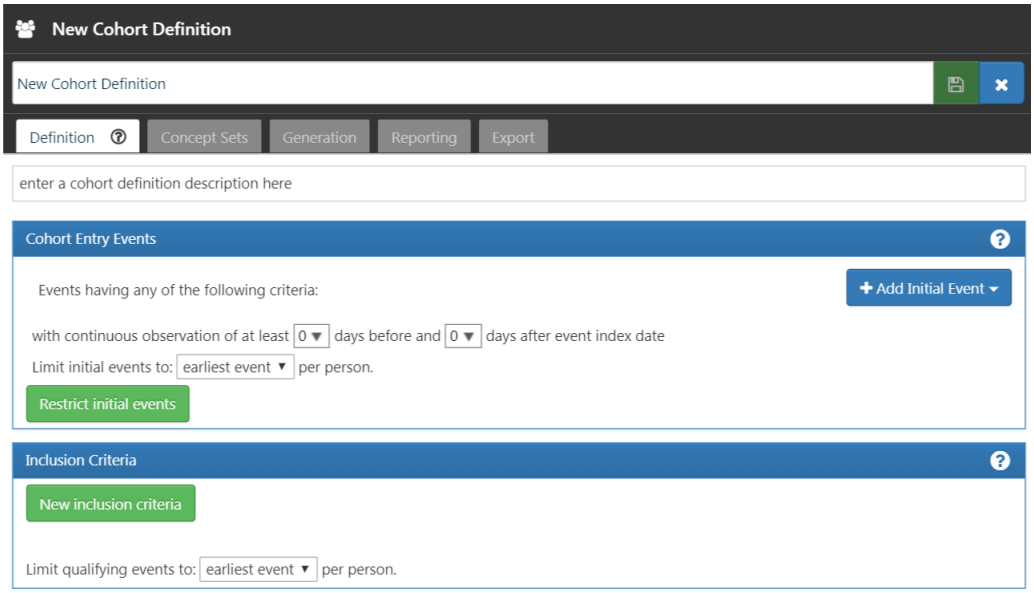

Figure 11.4: □□□□□□□□□□

□□□□□□□New Cohort Definition□□□□□□□□□□□

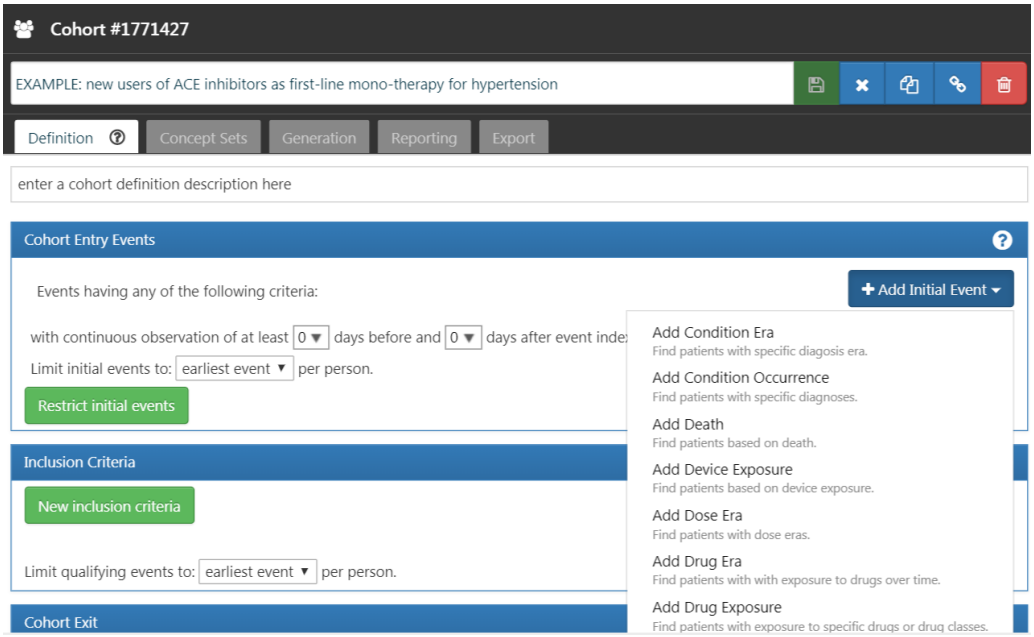

Figure 11.5: □□□□□□□□□□

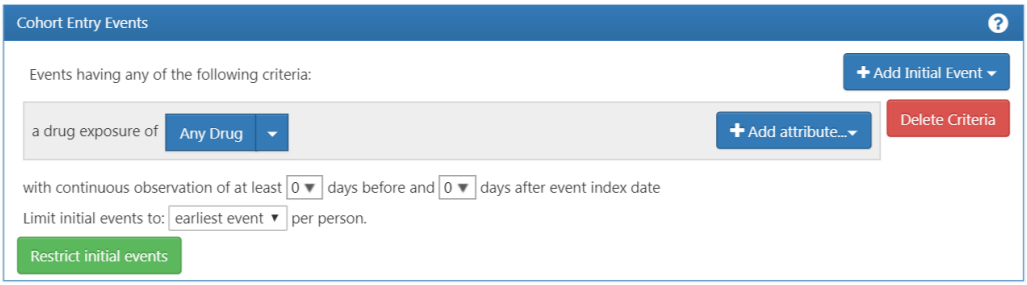

Figure 11.6: □□□□□□□

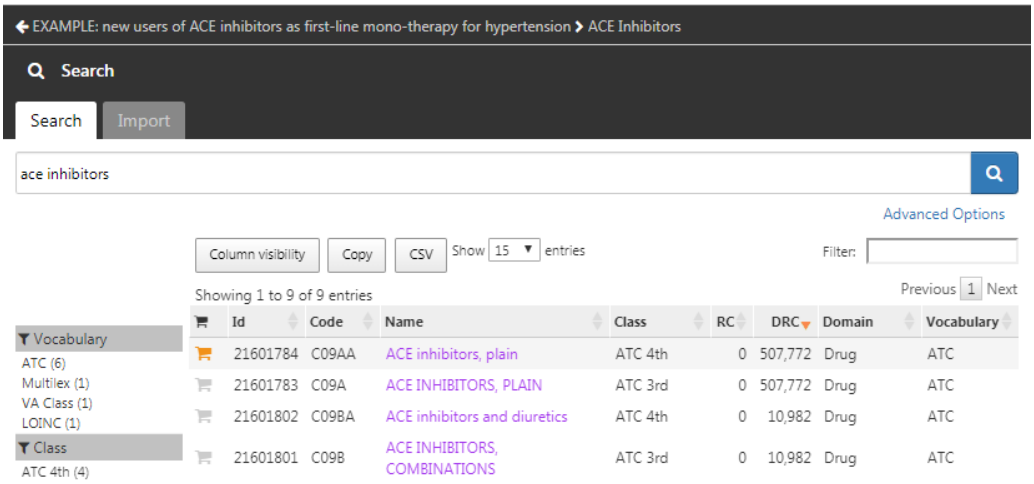

Figure 11.7: □□□□□ - ACE□□□

□□□□□□□□□□□□□□□□ □□□□□□□□□□□□□□□□□□□□□□□□□11.7□□□□□□□□□□□□□□□

□11.8□□□ACE□□□□□□□□□□□□□□□

□□□□**2:** □□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□ATLAS□□□□□□□□□□□□Import Concept Set□□□□□□□□□□□
inhibitors□□□□□□□□□□□□□□□□□□□

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 11.8: 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 11.9: ATLAS□□□□□□□□□□□□□□□□□□□□□□□□□□

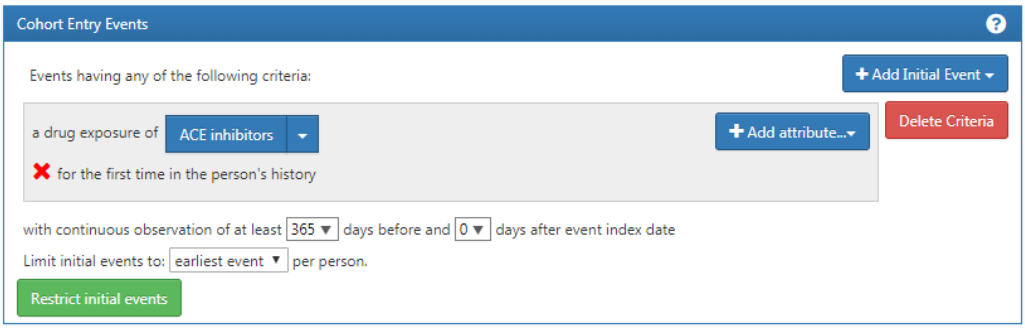

Figure 11.10: □□□□□□□□□□□□□□□□□□□□□□□□□□□□

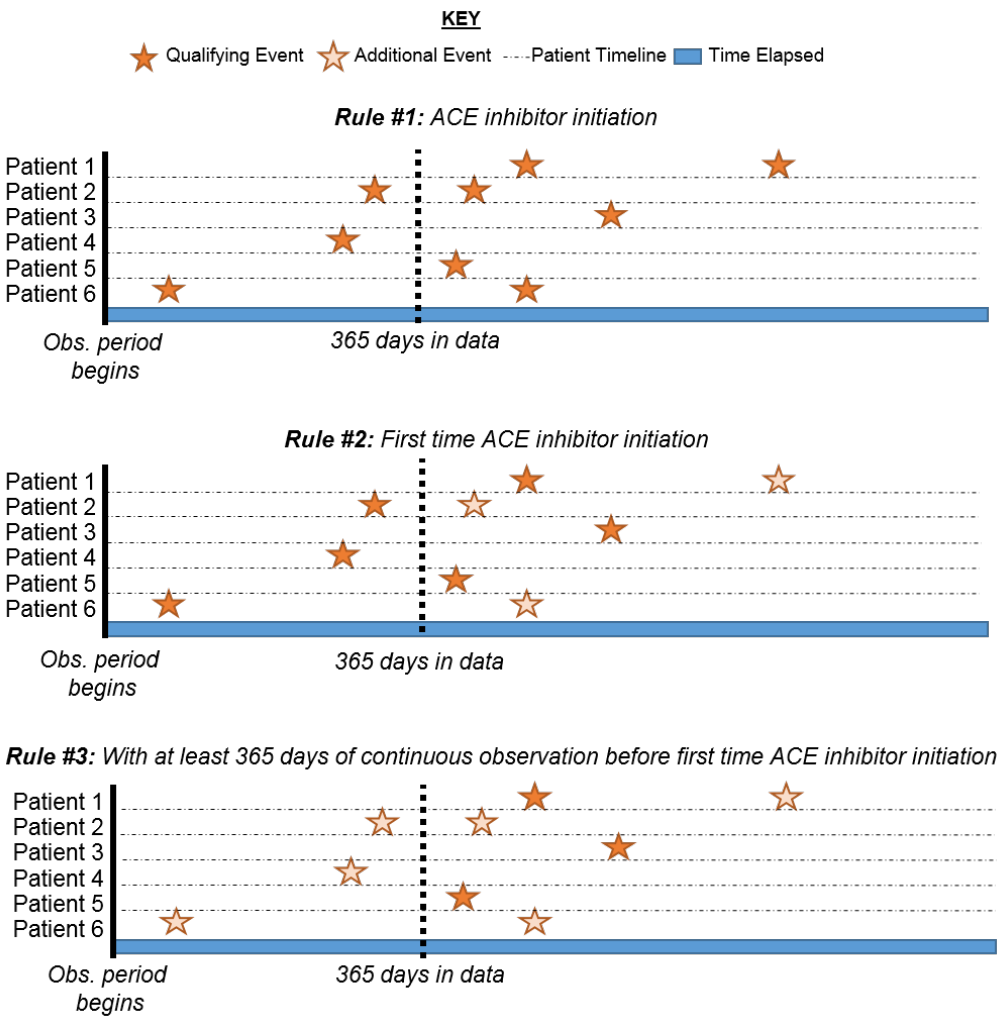

Figure 11.11: □□□□□□□□□□□□□□□□□□□

11.4.4

□□□□□□□

```
                    978555, 991382, 1305447, 1307046, 1307863, 1308216,
                    1308842, 1309068, 1309799, 1310756, 1313200, 1314002,
                    1314577, 1317640, 1317967, 1318137, 1318853, 1319880,
                    1319998, 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)
```

11.4.7

□□□□□□□ACE□□□□□□□□□□□□□□□□

```
conn <- connect(connDetails)

sql <- "SELECT person_id AS subject_id,
  MIN(drug_exposure_start_date) AS cohort_start_date
INTO #first_use
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 (@ace_i)
GROUP BY person_id;"

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

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

11.4.8 365

□□□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)
```

11.4.9

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)
```

□□SELECT DISTINCT□□□□□□□□□□□□□□□□□□□□□□

11.4.10

□□□□□□□□□□□□□□□□□□□□□□

```
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□□□□□□□□□□□

11.4.11

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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)
```

11.4.12

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

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```
sql <- "
SELECT ends.person_id AS subject_id,
    ends.concept_id AS cohort_definition_id,
  MIN(exposure_start_date) AS cohort_start_date,
  ends.era_end_date AS cohort_end_date
INTO #exposure_era
FROM (
  SELECT exposure.person_id,
    exposure.concept_id,
    exposure.exposure_start_date,
    MIN(events.end_date) AS era_end_date
  FROM #exposure exposure
  JOIN (
--cteEndDates
    SELECT person_id,
      concept_id,
      DATEADD(DAY, - 1 * @max_gap, event_date) AS end_date
    FROM (
      SELECT person_id,
        concept_id,
        event_date,
        event_type,
        MAX(start_ordinal) OVER (
          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)
```

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11.4.13

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- □□□□□□□□□□365□□□□□□□□□□□□□□
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Chapter 12

— —

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

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Elm et al., 2008)

12.3

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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 12.4: Atlas Data Sources: Conditions with ”hypertension” found in the concept name

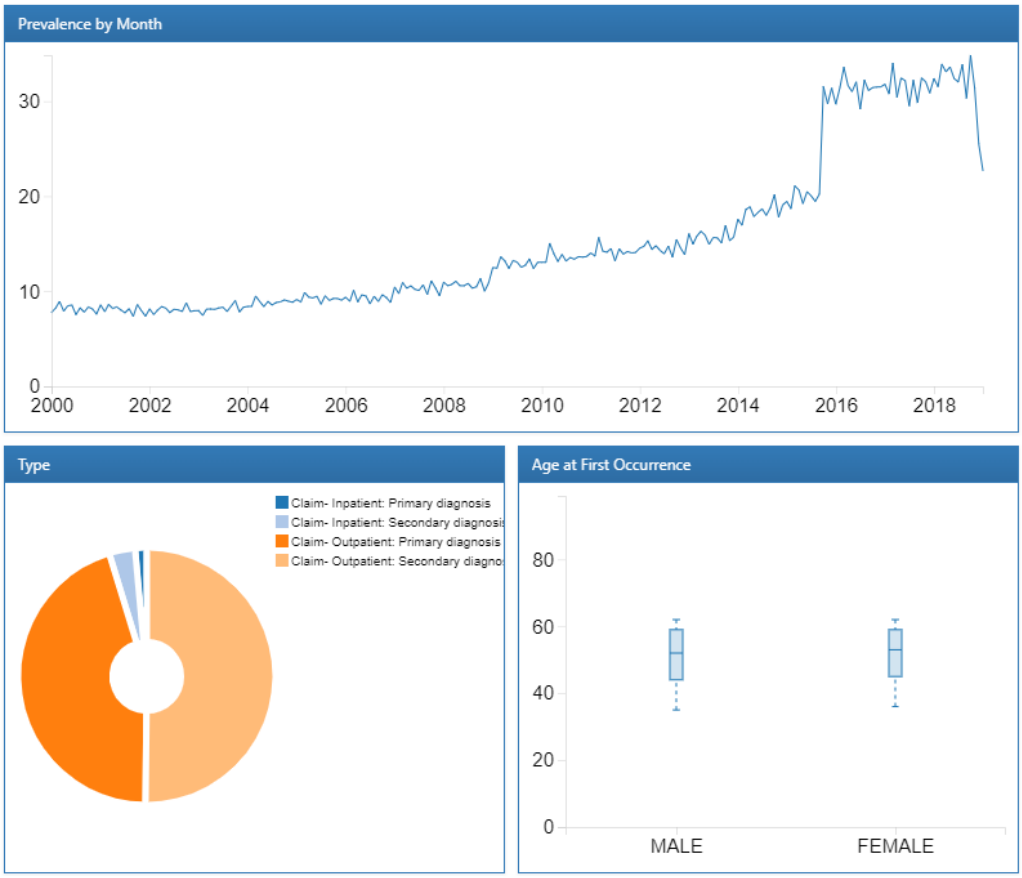

Figure 12.5: ATLAS□□□□□□□: □□□□□□□□□□□□□□□□□□□□

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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 12.7: □□□□□□ - □□□□

- **Any time prior**: □□□□□□□□□□□□□□□□□□□□□□□□□□□□
- **Long term**: □□□□□□□□□□□365□□
- **Medium term**: □□□□□□□□□□□180□□
- **Short term**: □□□□□□□□□□□30□□

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12.6.3

CONDITION / Condition Occurrence Long Term / stratified by Female

Export | Export comparison | Show 10 entries | Search: cardi

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	
Tachycardia	Explore	444070	17,322	1.04%	9,042	1.18%	6,547	0.78%	3,530	0.90%	-0.0193
Cardiomegaly	Explore	314658	20,958	1.26%	8,007	1.04%	9,016	1.08%	3,465	0.89%	-0.0121
Cardiac arrhythmia	Explore	44784217	30,474	1.83%	13,221	1.72%	14,540	1.74%	6,318	1.62%	-0.0052

Showing 1 to 3 of 3 entries (filtered from 206 total entries) Previous 1 Next

Figure 12.10: □□□□ - □□1□□□□□□□

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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 12.11: □□□□ - □□□□□□□

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 12.12: □□□□ - □□□□□□□

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

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

Export Show 10 entries Search: ang

Relationship type	Distance	Concept name	All stratas		Female	
			Count	Pct	Count	Pct
Explore Descendant	-2	Angioedema	2,605	0.16%	1,506	0.20%

Showing 1 to 1 of 1 entries (filtered from 56 total entries) Previous 1 Next

Figure 12.13: □□□□ - □□□□□□□□□□□

DEMOGRAPHICS / Demographics Age

Export Export comparison Show 10 entries Search:

Strata	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	Avg	Std Dev	Median	Count	Avg	Std Dev	Median	
Female	768,180	49.39	9.78	51.00	390,693	49.01	9.03	51.00	-0.0291
All stratas	1,661,604	48.96	10.00	50.00	837,459	48.64	9.26	50.00	-0.0232

Showing 1 to 2 of 2 entries Previous 1 Next

Figure 12.14: □□□□□□□□□□□□□□□□□□□□□□

Design

Criteria Custom

Analysis type:

Prevalence

Add Criteria feature

Ace inhibitor exposure after index

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

with at least 1 using all occurrences of:

a drug era of ACE inhibitors + Add attribute...

where event starts between 1 days After and All days After index start date add additional constraint

allow events from outside observation period

Delete Criteria

Figure 12.15: 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 12.16: □□□□□□□□□□□

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

```
settings <- createCovariateSettings(
  useDemographicsGender = TRUE,
  useDemographicsAgeGroup = TRUE,
  useConditionOccurrenceAnyTimePrior = TRUE)
```

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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)
```

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```
## CovariateData Object Summary
##

## Number of Covariates: 41330

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

12.7.5

□□□□□covariateData□□□□□□□□□□□□□□□

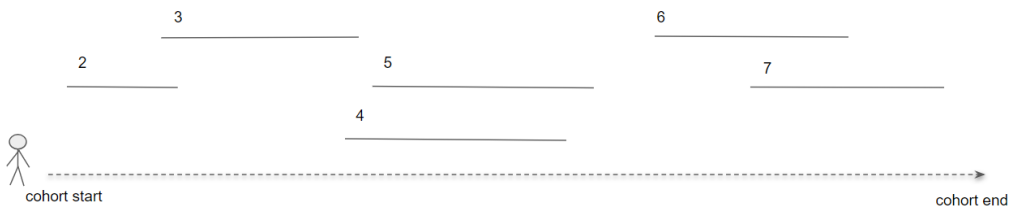

Figure 12.17: □□□□□□□□□□□□□□□□□□□□□□

12.7.7

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23.6, 23.7□□□□□□□□□□□□2□□□□□□□□□□□□□□□□□□□□

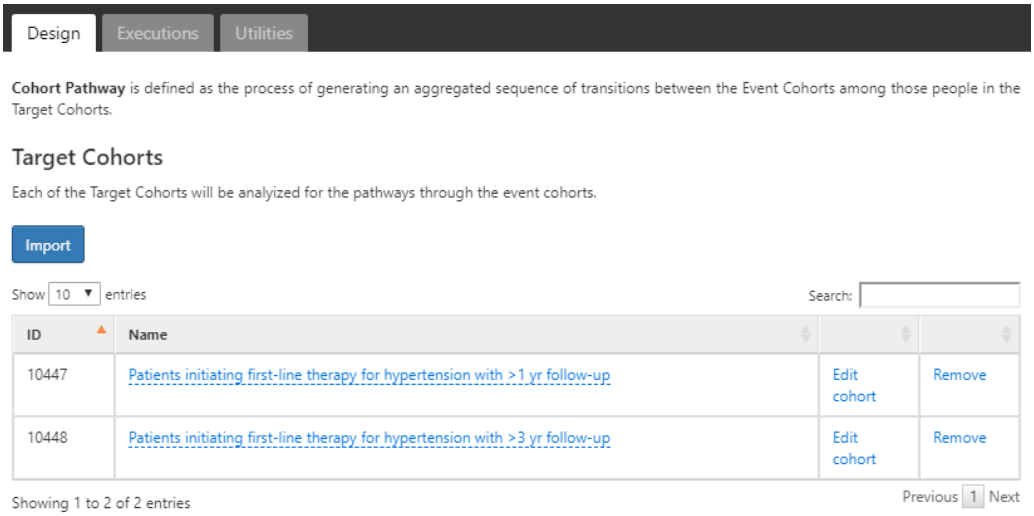

Figure 12.18: □□□□□□□□□□□□□□□□□□□□□□□□

□□□ACE
23.8-23.16□□□□□□□□□□□□□□□□□□□□ Import □□□□□□□□□□□□□□□□□□□□

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 12.19: □□□□□□

12.7.9

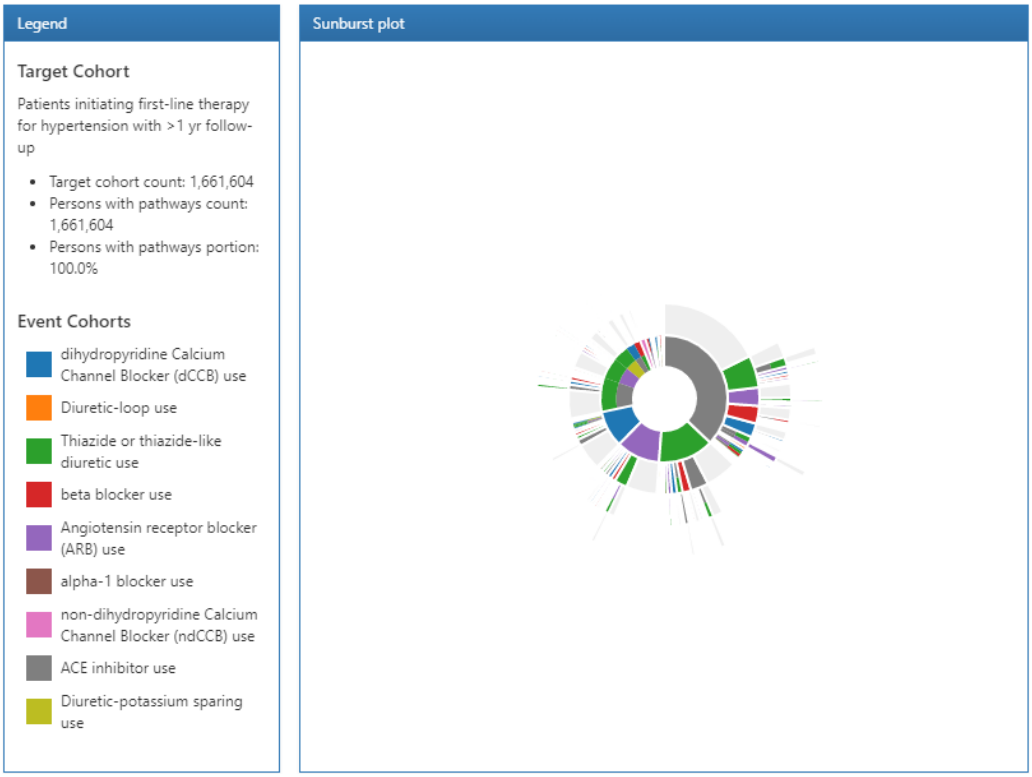

Figure 12.20: □□□□□□□□□□□□□

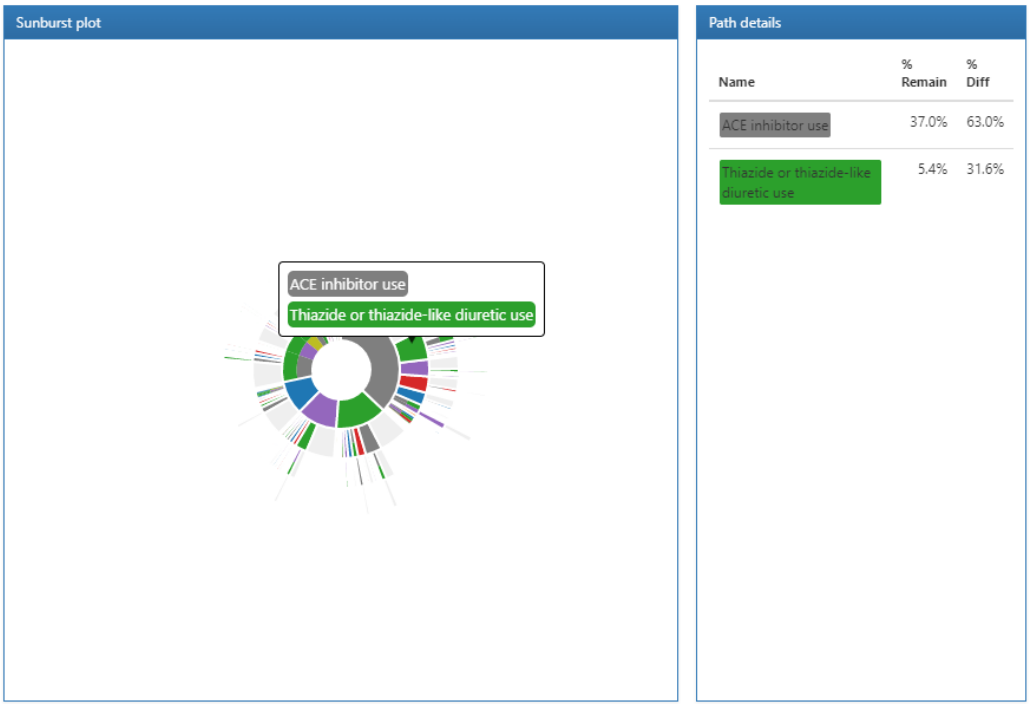

Figure 12.21: □□□□□□□□□□□□□□□□□□□

(Appendix 23.4, 23.3, 23.9) □□□□□□□□□□□□□□□□□□

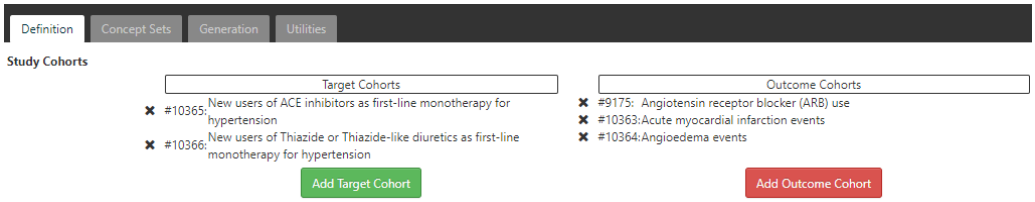

Figure 12.22: □□□□□□□□□□□□□□□□□□□□□□□

□□□□□□ *New users of ACE inhibitors* □□□□□ *New users of Thiazide or Thiazide-like diuretics* □□□□□□□□□□□□□□□□□□□□

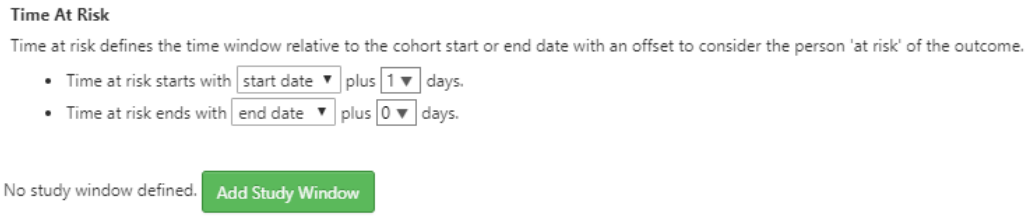

Figure 12.23: □□□□□□□□□□□□□□□□□□□□□□□□

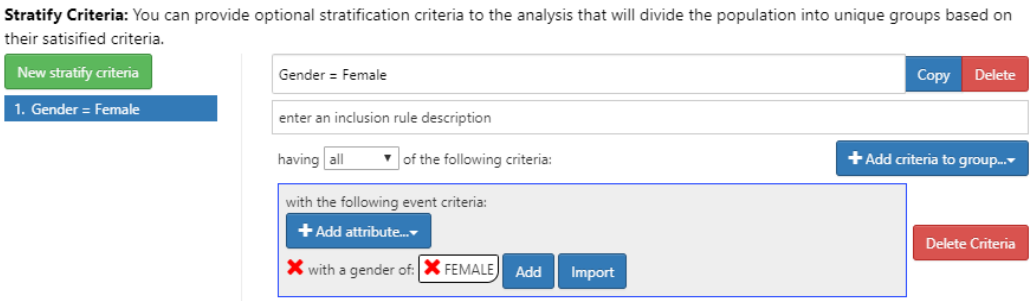

Figure 12.24: □□□□□□□□□□□□□□

12.7.11

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□□□□□□□ Reports □□□□□□□□□□□□□□□□□□□□□□□□□□□:

	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

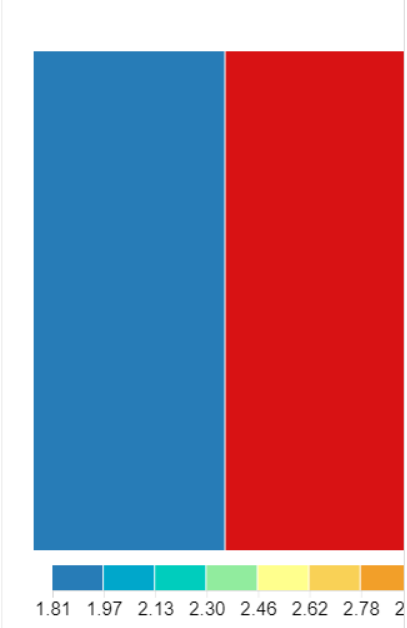

Figure 12.26: □□□□□□□□□ - AMI □□□□□□□□□□□□ ACEi □□□□

□□□□□□□□□□□□□□TAR □□□□□□□□□□□□□□□□□□□□

	Persons	Cases	Proportion [+|-] per 1k persons	Time At Risk (years)	Rate [+|-] per 1k years
Summary Statistics:	818,520	43,868	53.59	621,094	70.63

Stratify Rule	N	Cases	Proportion [+|-] per 1k persons	Time At Risk (years)	Rate [+|-] per 1k years
1. Gender = Female	313,832	21,049	67.07	228,369	92.17

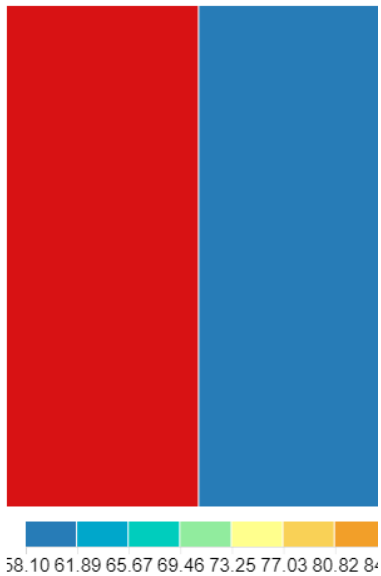

Figure 12.27: □□□ - ACEi □□□□ ARB □□□□□□□□□□□ ACEi □□□□

12.9

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□□□□□□□□□□ATLAS □□□□□□□□□□□□□□□□□□□□□http://atlas-demo.ohdsi.org □□□□□□□□□□□□□□□□□□□□

Chapter 13

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

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Table 13.2: □□□□□□□□□□□□□□□□□□□□□□□□□

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

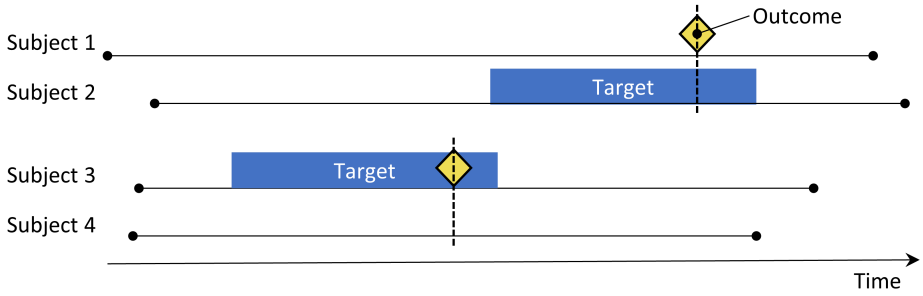
Outcome
Subject 1
Subject 2
Target
Subject 3
Target
Subject 4
Time

Figure 13.3: □□□□□□□□□

Table 13.4: □□□□□□□□□□□□□□□□□□□□

Choice	Description
Outcome cohort	□□□□□□□□□□□□□□□□□□□□
Target cohort	□□□□□□□□□□
Time-at-risk	□□
Control time	□□□□□□□□□□□□□□□□□□□□□

Table 13.5: □□□□□□□□□□□□□□□□□□□□□□□□□

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et al., 2012)□□□□□□□□□□□□ACEi□β□□□□□□□□□□□□

13.3.8

□□□□1□□□□□□□□□□□

Negative controls for ACEi and THZ

Optimize

Concept Set Expression | Included Concepts 75 | Included Source Codes | Explore Evidence | Export | Compare

Show 25 entries

Search:

Showing 1 to 25 of 75 entries

Previous 1 2 3 Next

Concept Id	Concept Code	Concept Name	Domain	Standard Concept Caption	Exclude	Descendants	Mapped
72748	74779009	Strain of rotator cuff capsule	Condition	Standard			
73241	197210001	Anal and rectal polyp	Condition	Standard			
73560	55260003	Calcaneal spur	Condition	Standard			
75911	65358001	Acquired hallux valgus	Condition	Standard			
76786	63643000	Derangement of knee	Condition	Standard			

Figure 13.7: □□□□□□□□□□□□□□□□□□□

Concept Set #1798551

Concepts to exclude for ACEi and THZ

Optimize

Concept Set Expression | Included Concepts 38225 | Included Source Codes | Explore Evidence | Export | Compare

Show 25 entries

Search:

Showing 1 to 14 of 14 entries

Previous 1 Next

Concept Id	Concept Code	Concept Name	Domain	Standard Concept Caption	Exclude	Descendants	Mapped
1342439	38454	trandolapril	Drug	Standard		✓	
1334456	35296	Ramipril	Drug	Standard		✓	
1331235	35208	quinapril	Drug	Standard		✓	
1373225	54552	Perindopril	Drug	Standard		✓	
1310756	30131	moexipril	Drug	Standard		✓	

Figure 13.8: □□□□□□□□□□□□□□□□□□□

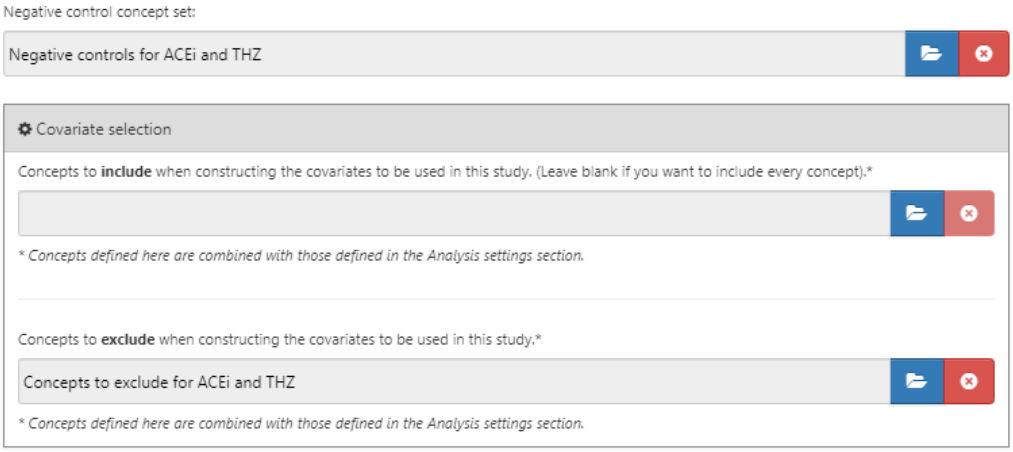
Negative control concept set:
Negative controls for ACEi and THZ
Covariate selection
Concepts to **include** when constructing the covariates to be used in this study. (Leave blank if you want to include every concept).*
* Concepts defined here are combined with those defined in the Analysis settings 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 13.9: □□□□□□□□□□□□

```
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
(?(CohortMethod))□□□□□□□□□□□□□□□□□□□

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

13.3.14

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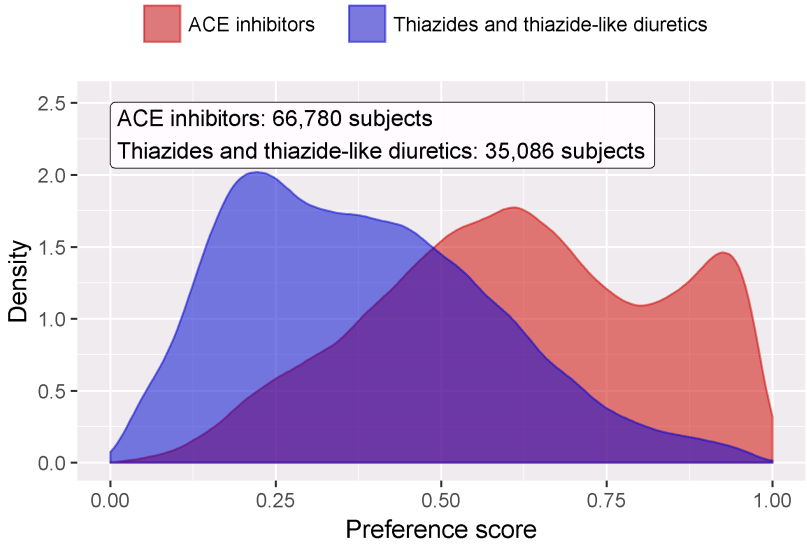

Figure 13.10: □□□□□□□□

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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□□□□□□□□□□□□: □□□□□□□□□□
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0.50	□□: □□

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13.3.17

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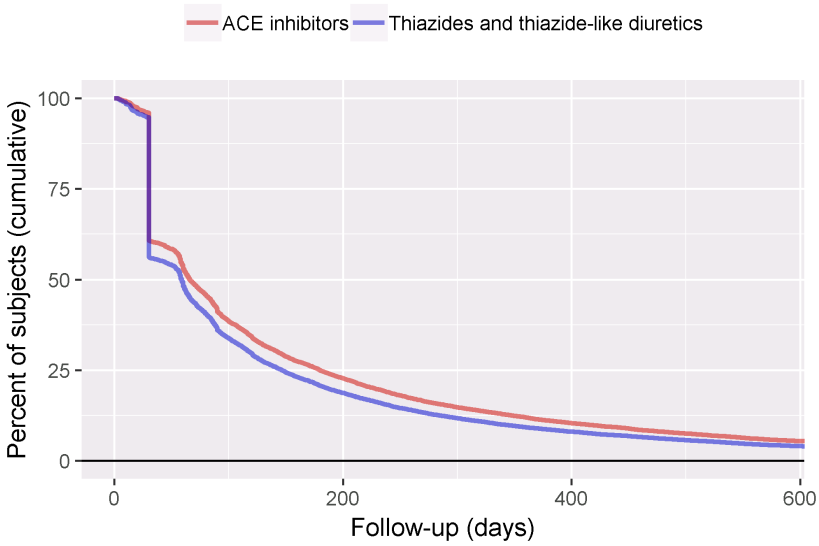
ACE inhibitors
Thiazides and thiazide-like diuretics
Percent of subjects (cumulative)
100
75
50
25
0
0
200
400
600
Follow-up (days)

Figure 13.13: □□□□□□□□□

13.4

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□□ **13.6.** PS□□□□□□□□

Chapter 14

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□*Lead: Peter Rijnbeek & Jenna Reps*

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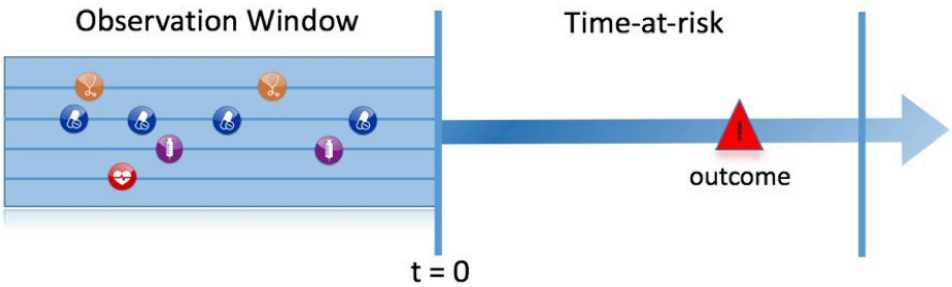

Figure 14.1: □□□□□

□□ □□□□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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14.1.6 K-

K-nearest neighbors (KNN) □□□□□

14.1.10

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14.1.14

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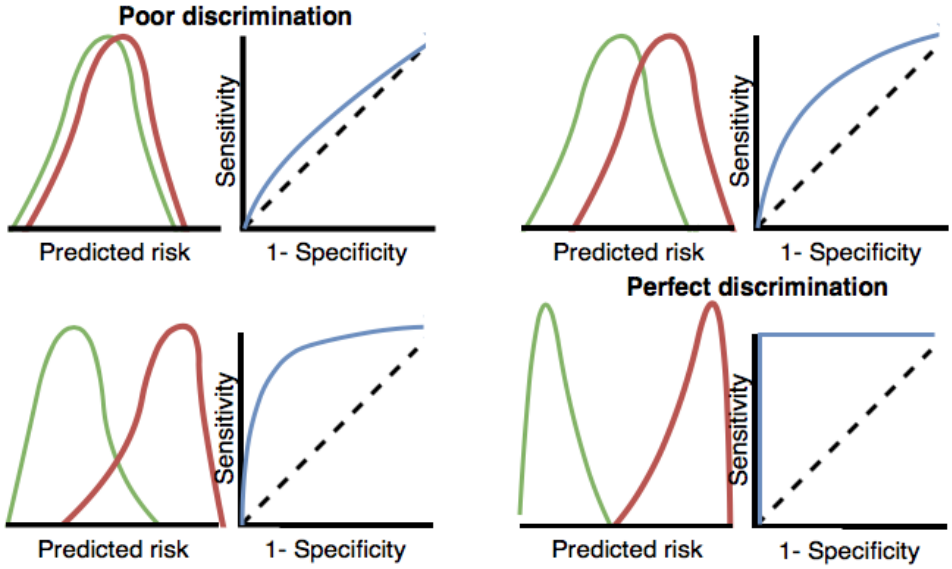

Figure 14.3: □□□□□□□□□ROC□□□□□□2□□□□□□□□

14.1.16

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14.2.1

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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 14.5: □□□□□□□□□□□□□□□□

**model? (Leave blank if you want to include everything)□□□□□□□

- □□ [□□□□□-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 14.8: □□□□□□□□□□.

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

14.2.3

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```
  useDrugGroupEraLongTerm = TRUE,
  useDrugGroupEraAnyTimePrior = TRUE,
  useVisitConceptCountLongTerm = TRUE,
  longTermStartDays = -365,
  endDays = -1)
```

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

```
                                    minTimeAtRisk = 364,
                                    requireTimeAtRisk = TRUE,
                                    includeAllOutcomes = TRUE,
                                    verbosity = "DEBUG"
)
```

14.2.6

□□□□□□□

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

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

14.2.7

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

```
plpResult <- loadPlpResult(file.path(outputFolder,
                                     'Analysis_1',
                                     'plpResult'))
```

□□□□Analysis_1□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□Shiny□□□□□□□□□□□□□□□□□

```
viewPlp(plpResult)
```

Shiny□□□□□□□□□□□□□□□□□□□

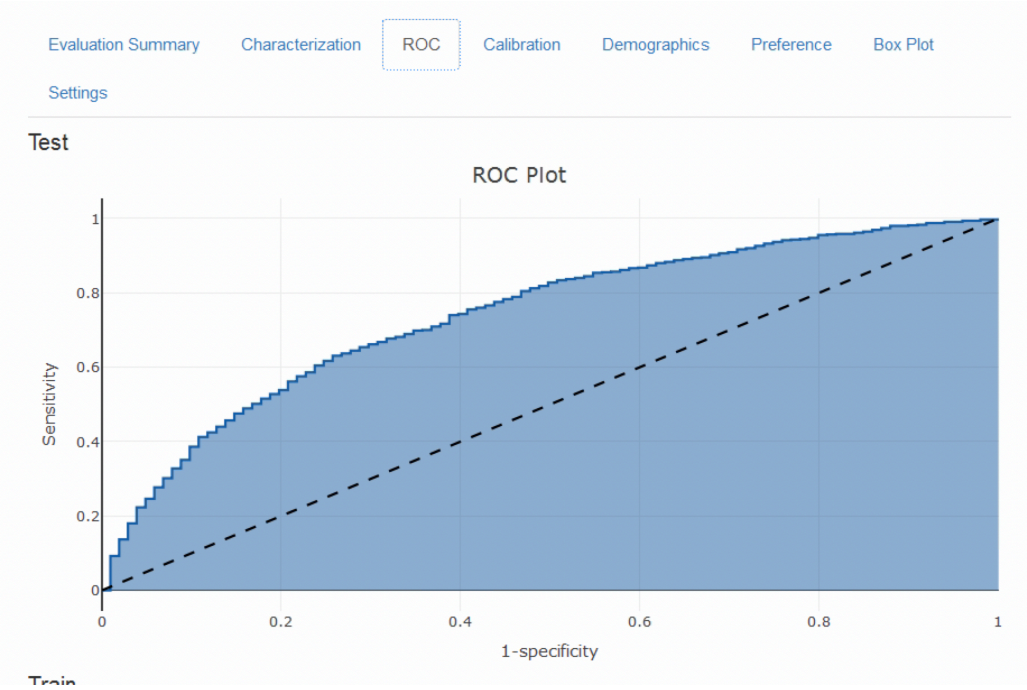

Figure 14.11: ROC□□□□□

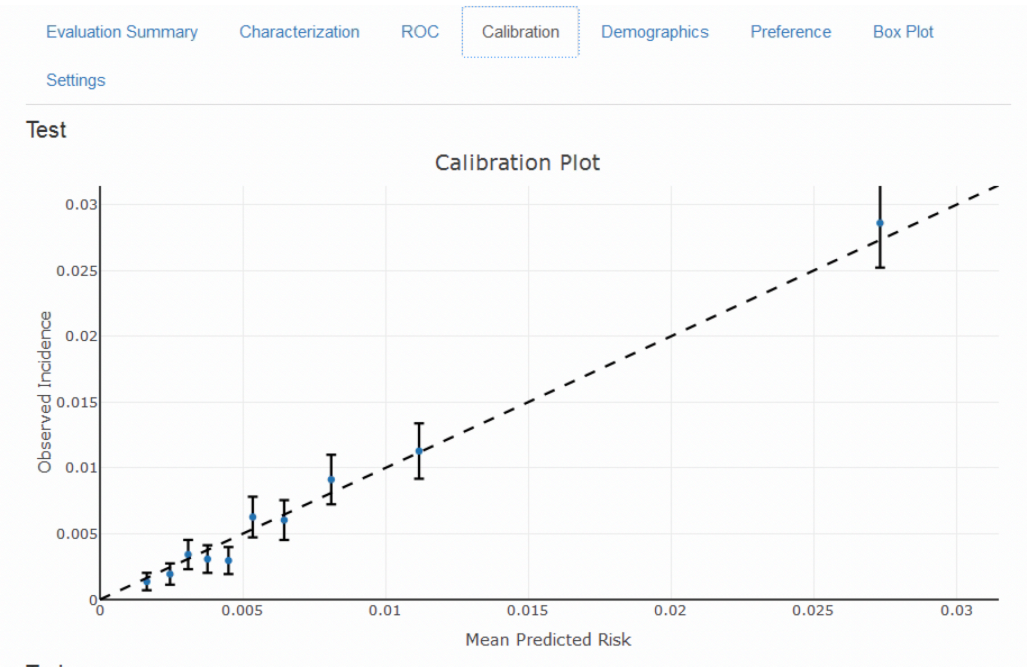

Figure 14.12: □□□□□□□□□□□□□□

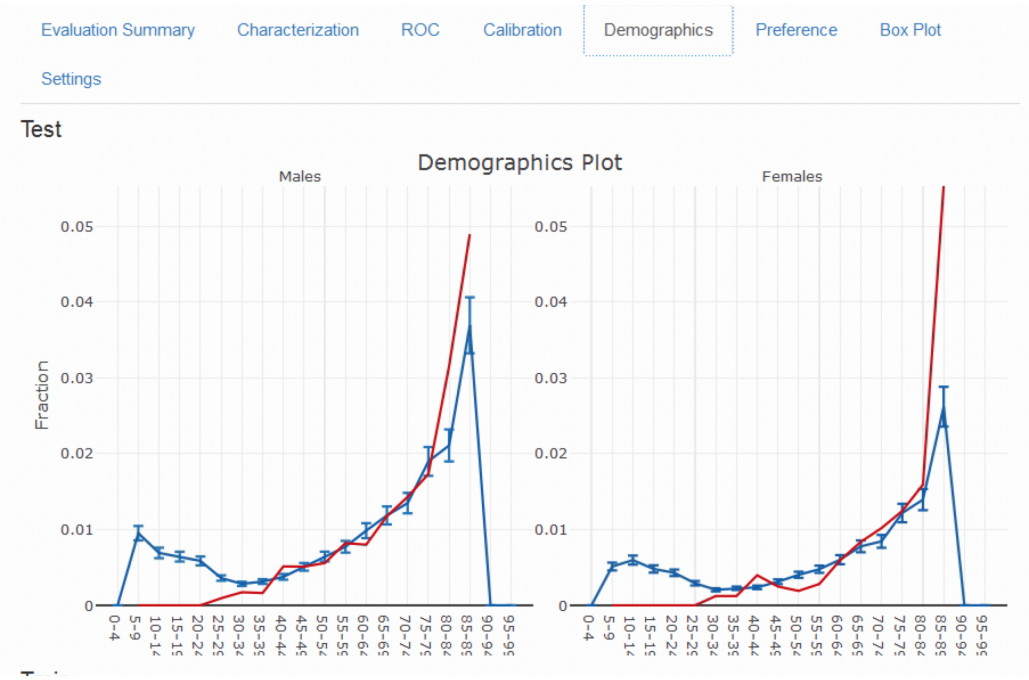

Figure 14.13: □□□□□□□□□□□□□□□□□□□□□

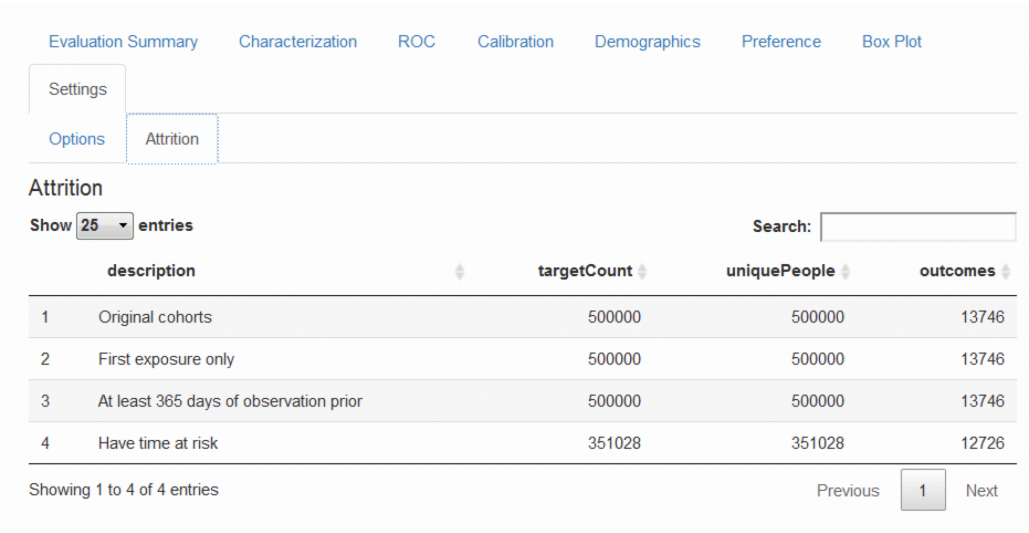

Figure 14.14: □□□□□□□□□attrition□□□□

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□□□□□□□□□□Shiny□□□□□□□14.15□□□□□□□□□□□□□□□□□□

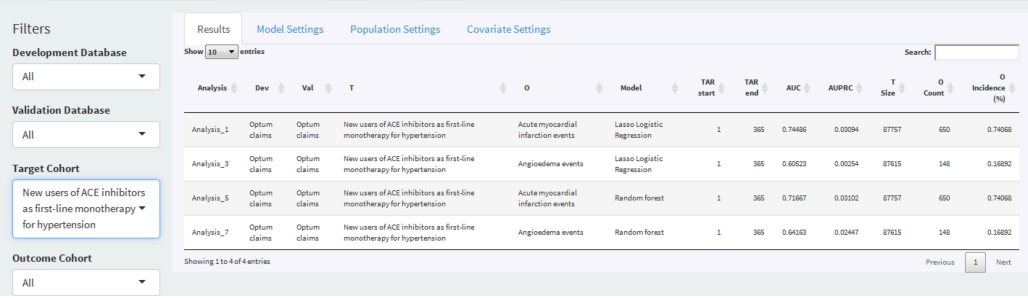

Figure 14.15: □□Shiny□□□□□□□

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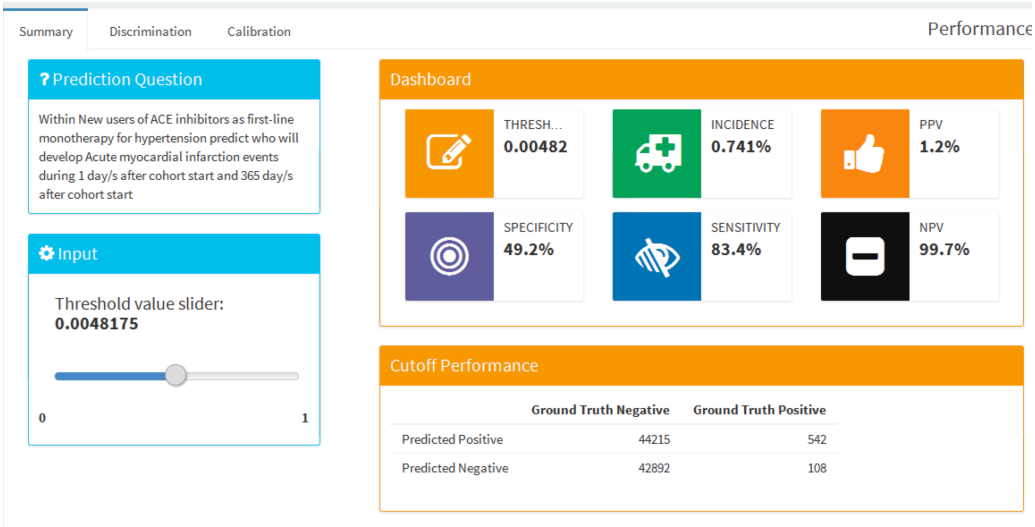

Figure 14.17: □□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□Discrimination□□□□□□□□□□□ROC□□□□□□□□-□□□□□□□□□□□□□□□□□□□

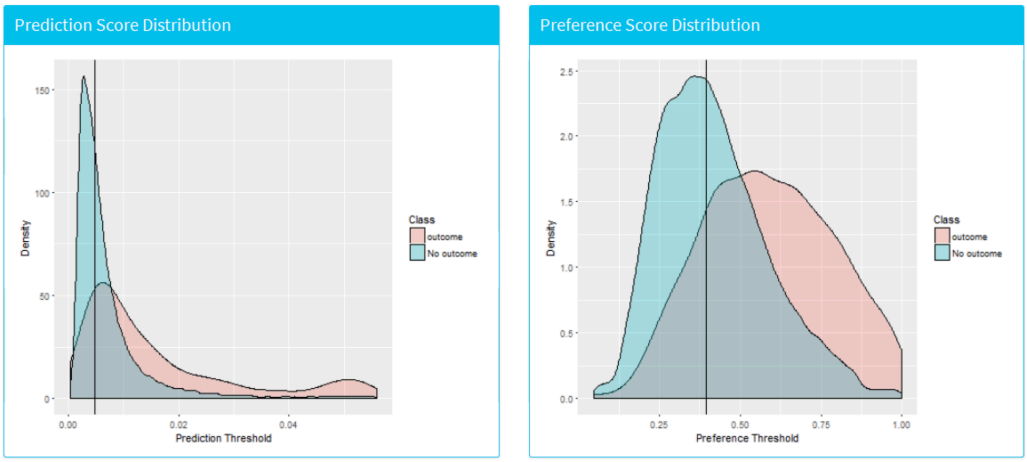

Figure 14.19: □□□□□□□□□□□□outing□□□□□□□□□□□

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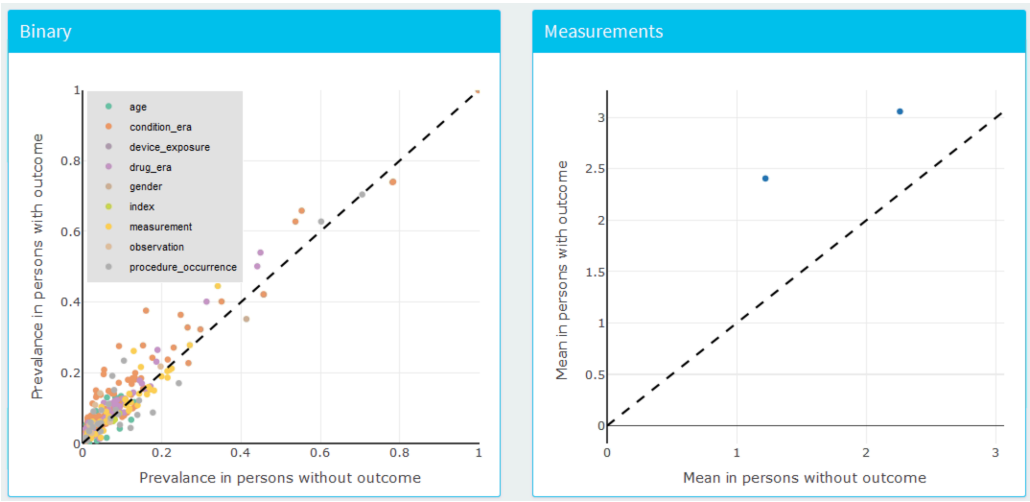

Figure 14.21: □□□□□□□□□□□□□□□□□□□□

Model Table

Download Model

Show 10 entries

Search:

	Covariate Name	Value	Outcome Mean	Non-outcome Mean
1	age group: 00-04	0	0.0004	0.0001
2	age group: 05-09	0	0	0.0003
3	index month: 1	0	0.1307	0.1096
4	observation during day -365 through 0 days relative to index: Domain	0	0.1188	0.0514
5	Charlson index - Romano adaptation	0	2.4783	1.3817
6	Diabetes Comorbidity Severity Index (DCSI)	0.1478	2.4056	1.2207
7	CHADS2VASc	0.9279	3.0573	2.2576
8	visit_occurrence concept count during day -365 through 0 concept_count relative to index	0	19.5263	13.8837
9	age group: 10-14	0	0	0.001
10	index month: 2	0	0.0934	0.0909

Showing 1 to 10 of 67,897 entries Previous 1 2 3 4 5 ... 6790 Next

Figure 14.22: □□□□□□□□□□□

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14.4

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Chapter 15

□□□□□□□□: *Patrick Ryan & Jon Duke*

15.1

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15.2

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Chapter 16

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

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17□Chapter 18□Chapter 19 □□□□□□□□□□□□□ ## □□□□□□□□□□

□□□Kahn et al.
(2016) □□□□□□□□□□□□□□□□□□□□DQ□□□□3□□□□□□□□□□□□□□□□□□□□□□

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0.09	DRUG_ERA □□□□□ drug_concept_id □□□□□□□□□□□□□□□□□□□□

□□□□□□Rabbit-in-a-Hat □□□□□□□

16.2

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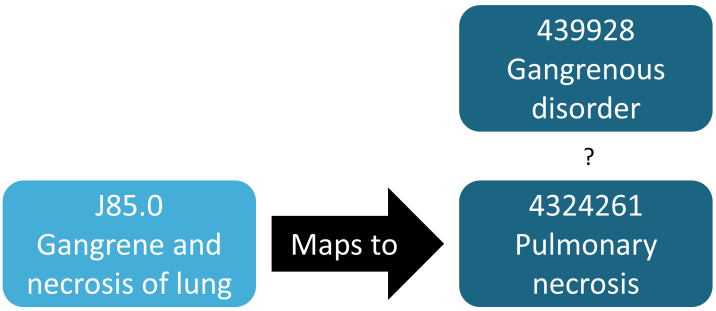

Figure 16.3: □□□□□□□□□□□□□□□□□

16.3 ACHILLES

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```
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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RESULTS

SYNTHEA SYNTHETIC HEALTH DATABASE

Results generated at 2019-08-22 14:15:06 in 29 mins

Column visibility CSV

Show 5 entries Search:

STATUS	CONTEXT	CATEGORY	SUBCATEGORY	LEVEL	DESCRIPTION	% RECORDS
FAIL	Verification	Plausibility	Atemporal	FIELD	The number and percent of records with a value in the gap_days field of the DRUG_ERA table less than 0. (Threshold=0%).	24.07%
FAIL	Verification	Completeness	None	FIELD	The number and percent of records with a value of 0 in the standard concept field race_concept_id in the PERSON table. (Threshold=0%).	16.74%
FAIL	Verification	Conformance	Relational	FIELD	The number and percent of records that have a value in the ethnicity_concept_id field in the PERSON table that does not exist in the CONCEPT table. (Threshold=0%).	16.15%
PASS	Verification	Completeness	None	FIELD	The number and percent of records with a NULL value in the condition_end_date of the CONDITION_OCCURRENCE. (Threshold=100%).	13.24%
PASS	Verification	Completeness	None	FIELD	The number and percent of records with a NULL value in the condition_end_datetime of the CONDITION_OCCURRENCE. (Threshold=100%).	13.24%

Showing 71 to 75 of 1,327 entries (filtered from 1,639 total entries) Previous 1 ... 14 15 16 ... 266 Next

Figure 16.5: Data Quality Dashboard□□□□□□□□□□□□□□□□□□□

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

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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 16.6: □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

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Chapter 17

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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 17.1: □□□□□□□□□□□□□□□

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17.1.2

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□□□□ **1: xSpec** □□□□□□□□

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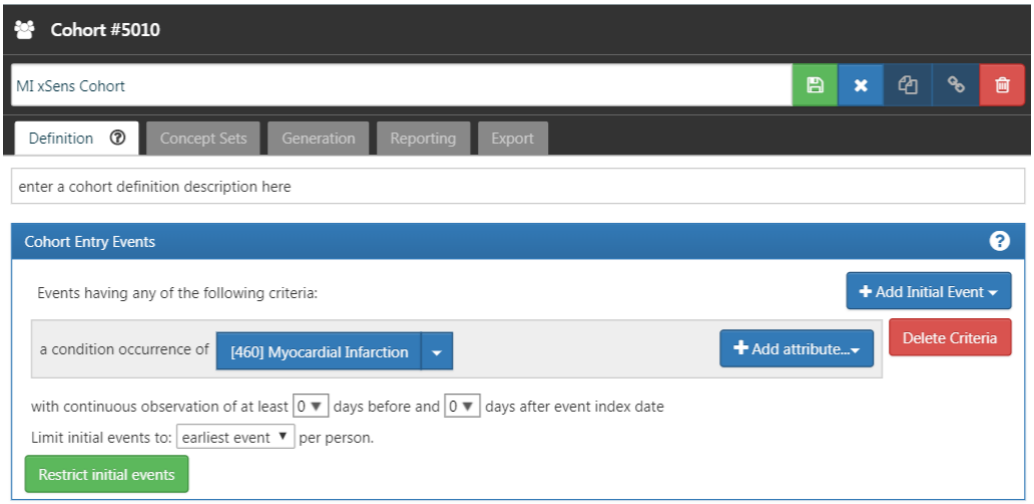

Figure 17.3: □□□□□□□□□□□□□□□□□□□□□□□□xSens□□

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 18

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□□□□□□□□: *Martijn Schuemie*

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18.1.6

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18.3

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Chapter 19

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□□□□□: *Martijn Schuemie*

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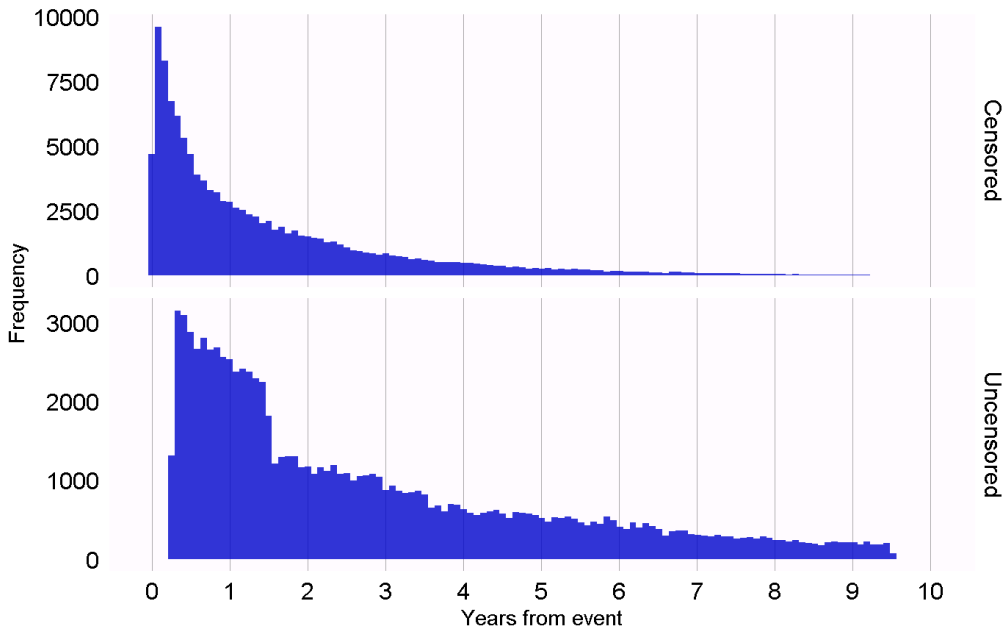

Figure 19.1: □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

19.2.1

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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 19.4: □□□□□□□□□

```
  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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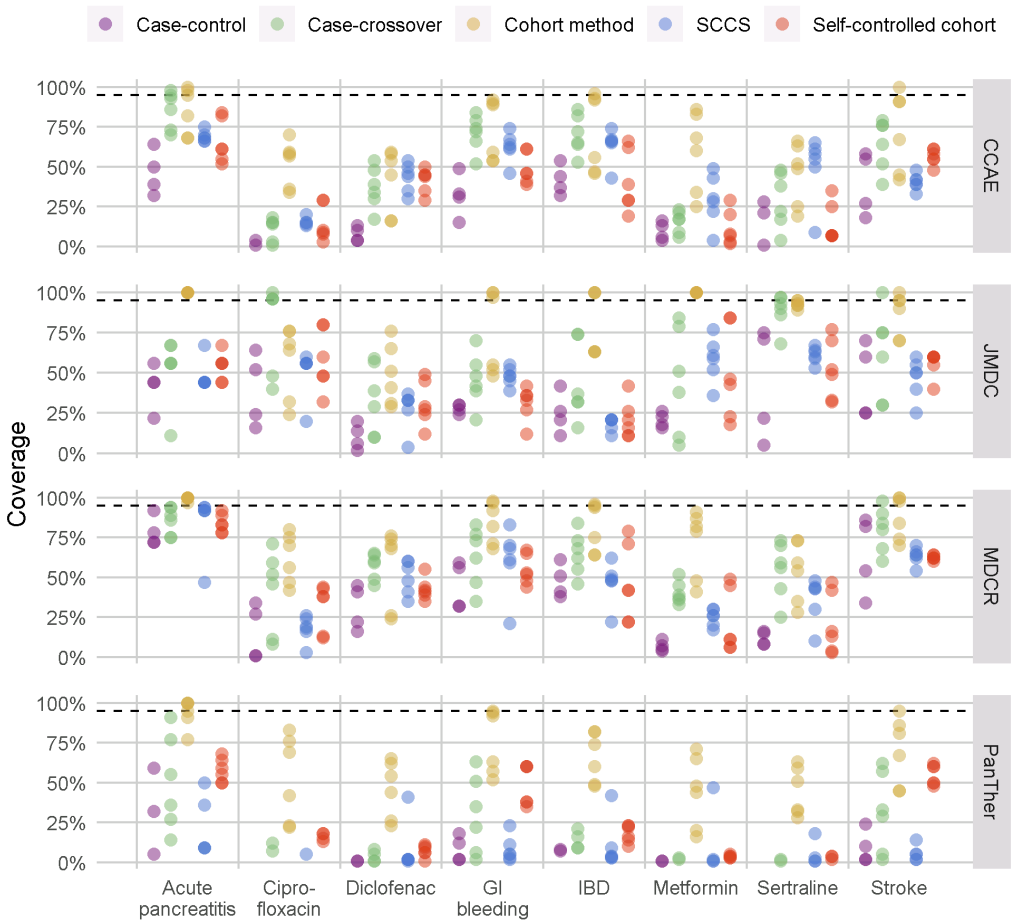

Figure 19.6: □□□□□□□□□□□□□□□□□□□□□95%□□□□□□□□□□□□□□□□□□□

Part II

OHDSI

Chapter 20

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

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Chapter 21

– – OHDSI

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

OHDSI□□□□

21.2.2 OHDSI

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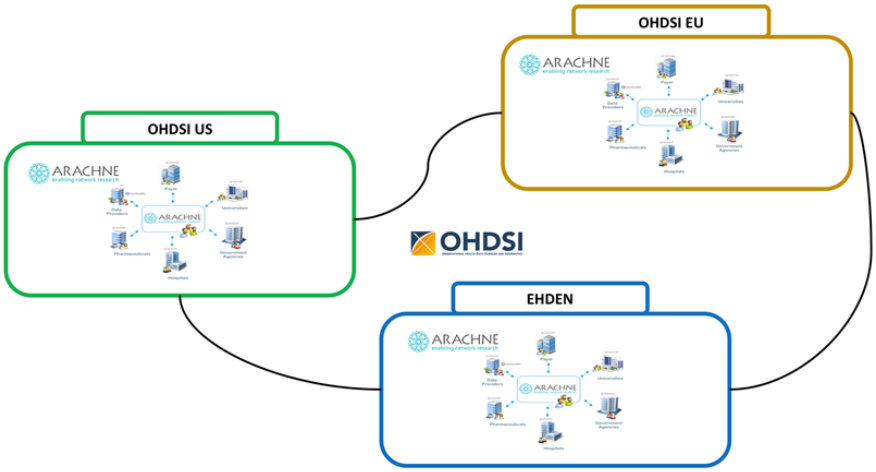

Figure 21.2: ARACHNE□□□□□□□□□□□□□□□□□□□

21.4

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

Chapter 22

ACHILLES □□□□□□□□□□□□□□□□□□□□□□
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ATLAS □□□□□□□□□□□□□□□□□□□□

□□□□□□□**Electronic Health Record, EHR**□ □□□□□□□□

□□□□□□□**Source code**□ □□□□□□□□□□□□□□□□□□□□□□□□□□□ICD-10□□□□

□□□□□□□□**Standard Concept**□ □□□□□□□□□□□□□□□CDM□□□□□□□□□□□□□□

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□□□**Vocabulary**□ □□6□□□

White Rabbit CDM□□ETL□□7□□□ ## □□□

Chapter 23

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

23.2 ACE

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1331235	□□□□□	□□□	□□	□□□
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1341927	□□□□□□	□□□	□□	□□□
1342439	□□□□□□□□	□□□	□□	□□□
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932745	□□□□□	□□□	□□	□□□
942350	□□□□□	□□□	□□	□□□
956874	□□□□□	□□□	□□	□□□
970250	□□□□□□□□	□□□	□□	□□□
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1307863	□□□□□	□□□	□□	□□□

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1308842	□□□□□□	□□□	□□	□□□
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1341927	□□□□□□	□□□	□□	□□□
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1398937	□□□□□	□□□	□□	□□□
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23.3 AMI

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1332418	□□□□□□	□□□	□□	□□□
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1346823	□□□□□□□	□□□	□□	□□□
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907013	□□□□□	NO	YES	NO
974166	□□□□□□□□□□□	NO	YES	NO
978555	□□□□□□	NO	YES	NO
1307863	□□□□□	NO	YES	NO
1308216	□□□□□□	NO	YES	NO
1308842	□□□□□□	NO	YES	NO
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1331235	□□□□□	NO	YES	NO
1332418	□□□□□□	NO	YES	NO
1334456	□□□□□	NO	YES	NO
1335471	□□□□□□	NO	YES	NO
1340128	□□□□□□	NO	YES	NO
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1342439	□□□□□□□□	NO	YES	NO
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1363749	□□□□□□	NO	YES	NO
1367500	□□□□□	NO	YES	NO
1373225	□□□□□□□	NO	YES	NO
1395058	□□□□□□□	NO	YES	NO
40226742	□□□□□□□	NO	YES	NO
40235485	□□□□□□□	NO	YES	NO

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904542	□□□□□□□	NO	YES	NO
907013	□□□□□	NO	YES	NO
932745	□□□□□	NO	YES	NO
942350	□□□□□	NO	YES	NO
956874	□□□□□	NO	YES	NO

□□□□□ID	□□□□□□	□□	□□	□□□□□
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
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

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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

□: □□□□□□

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316866	□□□□□□	NO	YES	NO

23.7 3

□□□□□□ *23.6* □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□365□□□□**1095**□□□□□□□□□□□□

23.8 ACE

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- *ACE*□□□□□□ 23.8□□□□□□□

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□: ACE□□□

□□□□□ID	□□□□□□	□□	□□	□□□□□
1308216	□□□□□□	NO	YES	NO
1310756	□□□□□□□	NO	YES	NO
1331235	□□□□□	NO	YES	NO
1334456	□□□□□	NO	YES	NO
1335471	□□□□□□	NO	YES	NO
1340128	□□□□□□	NO	YES	NO
1341927	□□□□□□	NO	YES	NO
1342439	□□□□□□□□	NO	YES	NO
1363749	□□□□□□	NO	YES	NO
1373225	□□□□□□□	NO	YES	NO

23.9 ARB

□□□□□□ *23.8* □□□□□□□□□□□□□□□□□□□□□□□□□□□□□*ARB*□□□□ 23.9□□*ACE*□□□□□□ 23.8□□□□□□□□□□□□□□

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□: □□□□□□□□□□□□□□□□□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

23.10

□□□□□□ *23.8* □□□□□□□□□□□□□□□□□□□□

□□□□□ID	□□□□□□	□□	□□	□□□□□
907013	□□□□□	NO	YES	NO
974166	□□□□□□□□□□	NO	YES	NO
978555	□□□□□□	NO	YES	NO
1395058	□□□□□□□	NO	YES	NO

23.11 dCCB

□□□□□□ *23.8* □□□□□□□□□□

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□□ID	□□□	□□	□□	□□□
1307046	□□□□□□□	NO	YES	NO
1313200	□□□□□	NO	YES	NO
1314002	□□□□□□	NO	YES	NO
1314577	□□□□□□	NO	YES	NO
1319998	□□□□□□□	NO	YES	NO
1322081	□□□□□□□	NO	YES	NO
1327978	□□□□□□□	NO	YES	NO
1338005	□□□□□□□	NO	YES	NO
1345858	□□□□□□	NO	YES	NO
1346823	□□□□□□□	NO	YES	NO
1353766	□□□□□□□□	NO	YES	NO
1386957	□□□□□□	NO	YES	NO

23.14

ACE□□□□□ 23.8 □□□□□□□□□□□□□ (□ 23.14) □ *ACE□□□* (□ 23.8) □□□□□□□□□□

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□□ID	□□□	□□	□□	□□□
932745	□□□□□	NO	YES	NO
942350	□□□□□	NO	YES	NO
956874	□□□□□	NO	YES	NO

23.15

ACE□□□□□ 23.8 □□□□□□□□□□□□□□□□ (□ 23.15) □ *ACE□□□* (□ 23.8) □□□□□□□□□□

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904542	□□□□□□□	NO	YES	NO
991382	□□□□□□	NO	YES	NO

23.16 1

ACE□□□□□ *23.8* □□□□□□□□□□*1*□□□□□ (□ 23.16) □ *ACE*□□□ (□ 23.8)□□□□□□□□□□

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1341238	□□□□□	NO	YES	NO
1350489	□□□□□	NO	YES	NO
1363053	□□□□□□	NO	YES	NO

23.17 – –

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46269889	□□□□□□□□□□□
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	□□□□

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81634	□□□□
380706	□□□□□□
141932	□□□□□□
36713918	□□□□□□□□□□
443172	□□□□□□□□□□□□□
81151	□□□□□
72748	□□□□□□□□□□□□□□□□□□□
378427	□□□□
437264	□□□□□□
194083	□□□□□□□□□□
140641	□□□□□
440193	□□□□
4115367	□□□□

23.19 – –

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16. □□□□

23.20 NA

Chapter 24

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24.1

□□□□ **5.1**

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□: 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	

□□□□ **5.2**

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□: 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 □□□□□□□□□□□□□□

□□□□ **5.3**

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□: 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	

□□□□ 5.4

□□□□□□□□□□□□□□□□CONDITION_OCCURRENCE□□□□□□□□□□□□□□□□□□□

```
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 ...
```

□□□□ 5.5

□□□□□□□□□□□□□□□□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 ...
```

□□□□ 5.6

□□□□□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 ...
```

24.2

□□□□ 6.1

□□ ID 192671 (“□□□□”)

□□□□ 6.2

ICD-10CM□□□□

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

ICD-9CM□□□□

- 578 “□□□□”
- 578.9 “□□□□□□□□□□□□□”

□□□□ 6.3

MedDRA□□□□□

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

24.3

□□□□ 7.1

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

□□□□ 7.2

□□□	□	□□
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	

□□□□ 7.3

□□□	□
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

24.4

□□□□ 8.1

1. □□□□
2. □□□□□□□□
3. □□□□□□□□

□□□□ 8.2

□□□□□□□

```
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))□□□□□□□□□□□□□

```
  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□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

24.5

□□ 11.1

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□:

- □□□□□□□□□□□□□□
- 16□□□
- □□□□□□□□□□365□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□24.1□□□□□□□□□□

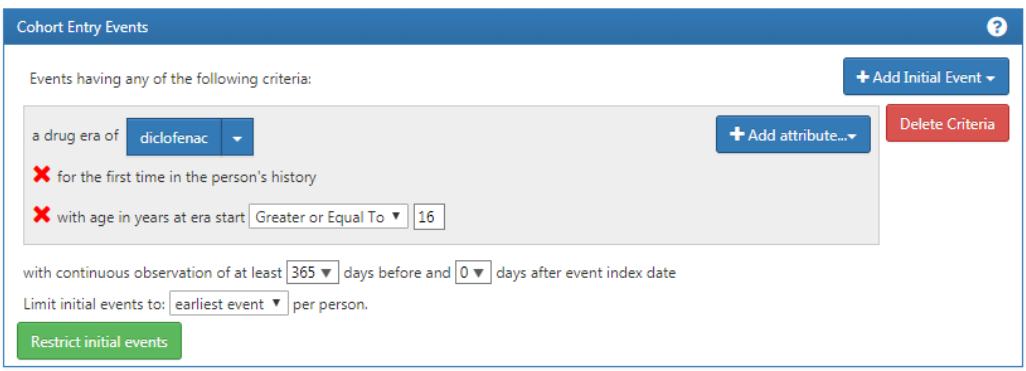


Figure 24.1: □□□□□□□□□□□□□□□□□□□□

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 24.2: □□□□□□□□□□□□□□□□□□

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 24.3: 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 24.4: NSAIDs□□□□□□□□□

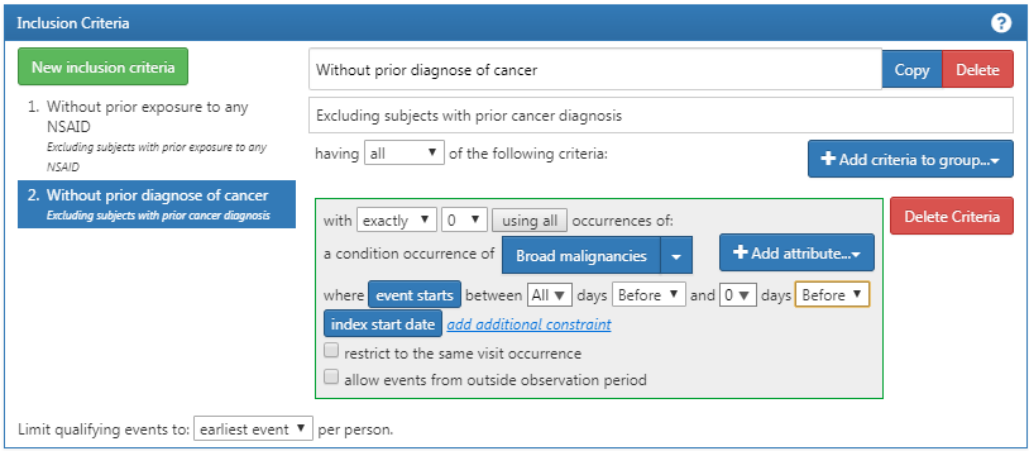


Figure 24.5: □□□□□□□□□□□□□□□□□□□

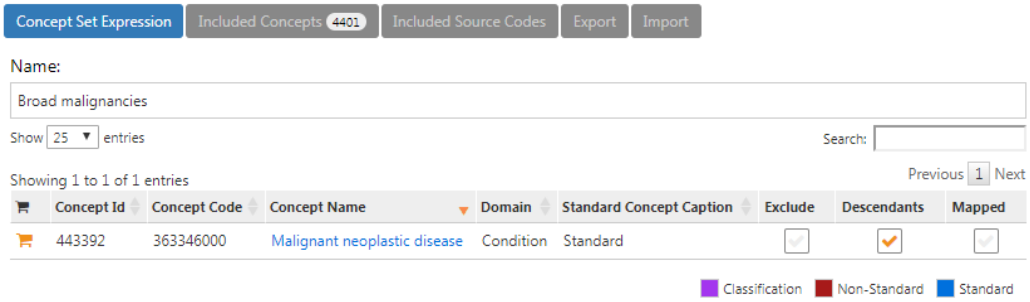


Figure 24.6: □□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□30□□□□□□□□□□□□□□□□□□□□□□□□24.7□□□

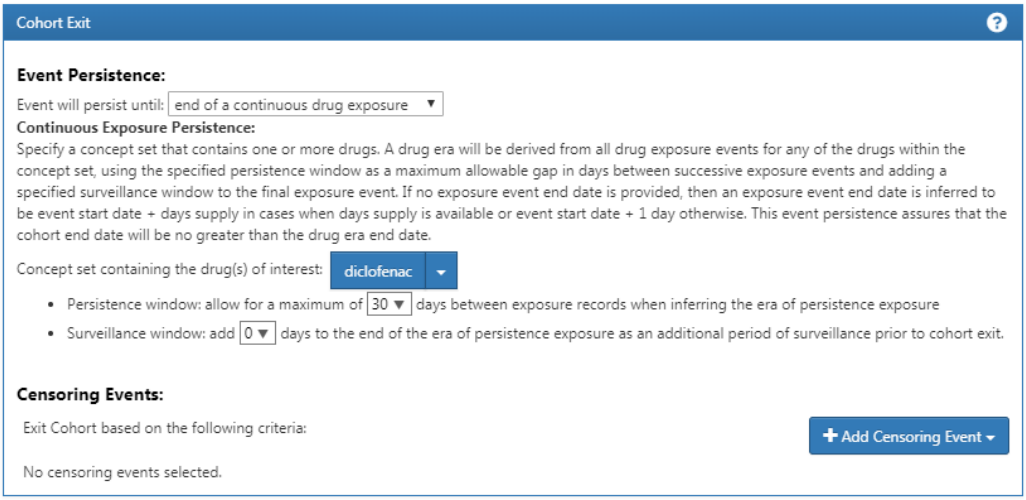


Figure 24.7: □□□□□□□□□□□□

□□ 11.2

□□□□□□□□□□SQL□2□□□□□□□□□□□□□□□□□□□

```
  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□□□□□□

Data Sources

SYNPUF 5%

Drug Exposure

SYNPUF 5% Drug Exposure Report

Prevalence

Treemap | Table

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

Showing 1 to 8 of 8 entries
(filtered from 18,541 total entries)

Previous 1 Next

Concept Id	Ingredient	Name	Person Count	Prevalence	Records per person
1118116	celecoxib	celecoxib 50 MG Oral Capsule [Celebrex]	3	0.00%	1.00
1118115	celecoxib	celecoxib 50 MG Oral Capsule	8	0.01%	1.00
1118113	celecoxib	celecoxib 400 MG Oral Capsule [Celebrex]	35	0.03%	1.03
1118091	celecoxib	celecoxib 400 MG Oral Capsule	440	0.38%	1.00
1118088	celecoxib	celecoxib 200 MG Oral Capsule [Celebrex]	845	0.73%	1.02
19029025	celecoxib	celecoxib 200 MG Oral Capsule	510	0.44%	1.01
1118087	celecoxib	celecoxib 100 MG Oral Capsule [Celebrex]	475	0.41%	1.02
19029024	celecoxib	celecoxib 100 MG Oral Capsule	253	0.22%	1.01

Showing 1 to 8 of 8 entries
(filtered from 18,541 total entries)

Previous 1 Next

Figure 24.8: □□□□□□□□□□□□□

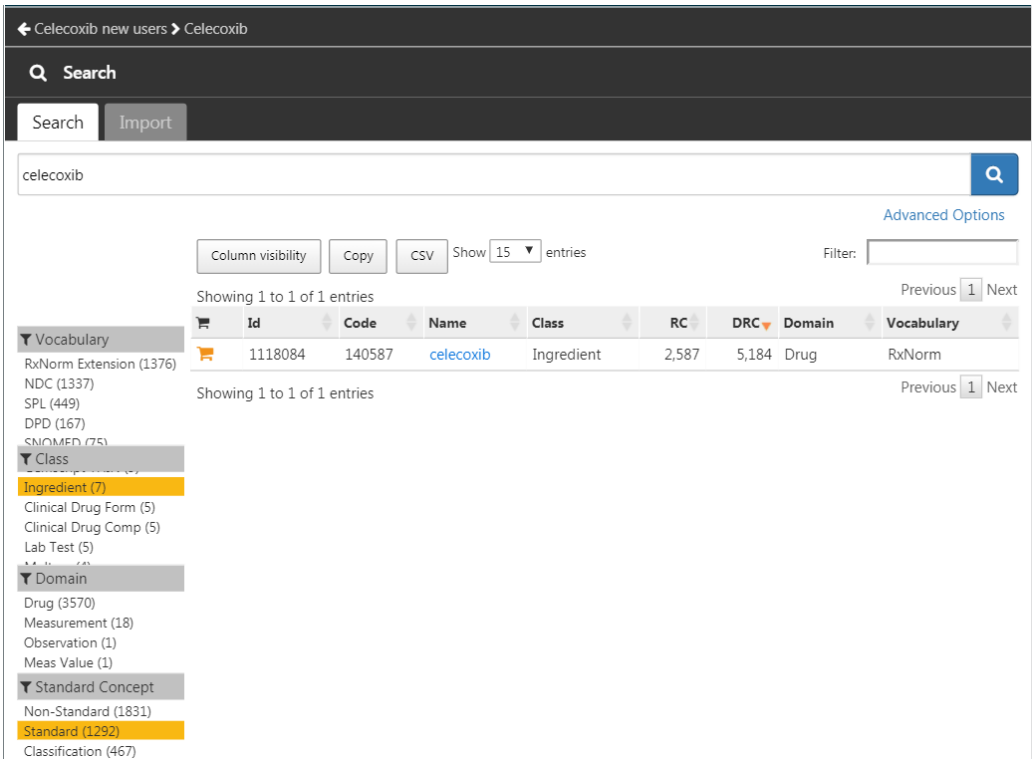


Figure 24.9: □□□□□□□□□□□□□□□□□□□□□□□□□□

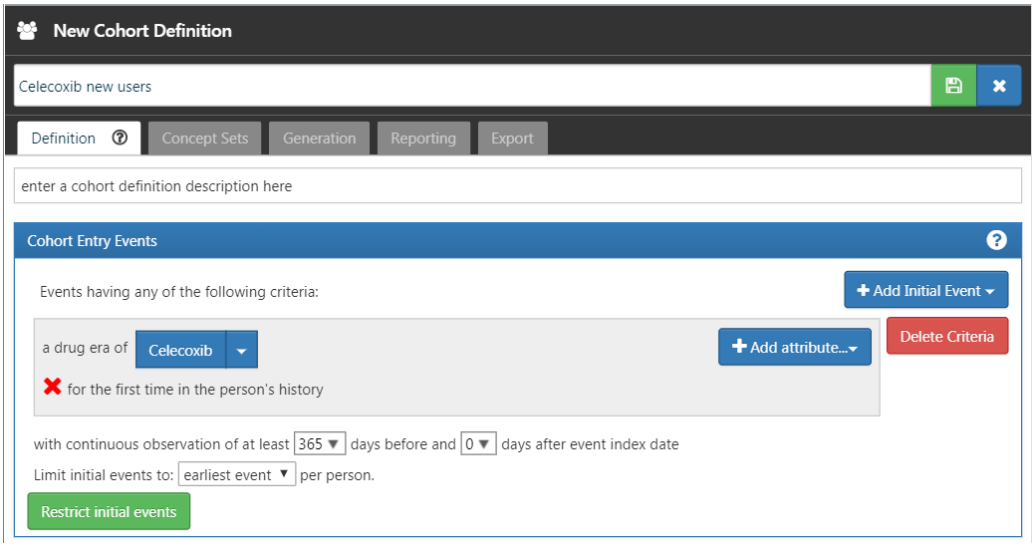


Figure 24.10: □□□□□□□□□□□□□□□□□□□□□□□□□□

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 24.11: □□□□□□□

□□□□□□□□□□□□□□1□□□□□□□□□□□□□□

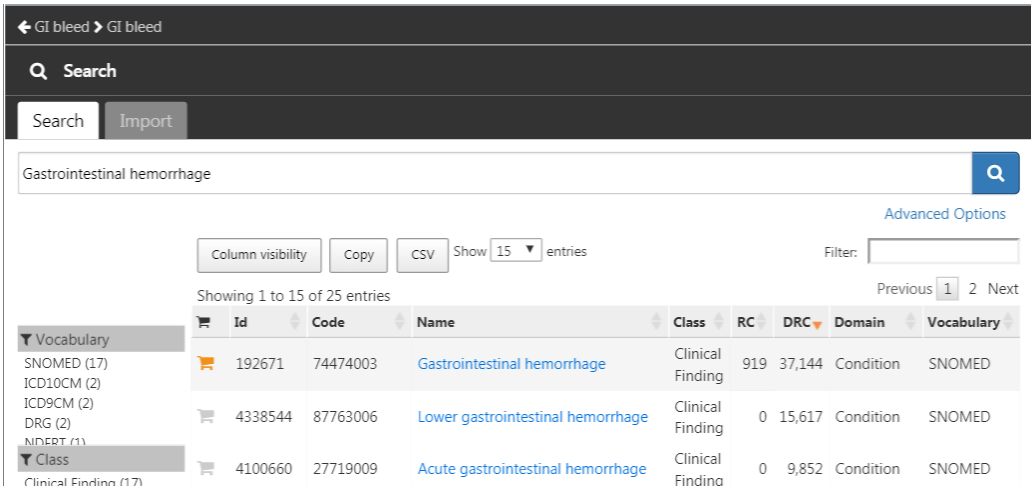


Figure 24.13: □□□□□□□□□□□□□□□□□□□□□

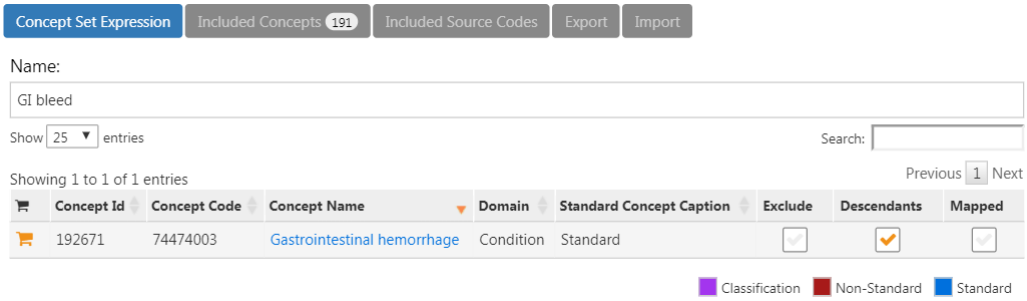


Figure 24.14: □□□□□□□□□□□□□□□□□□□□□

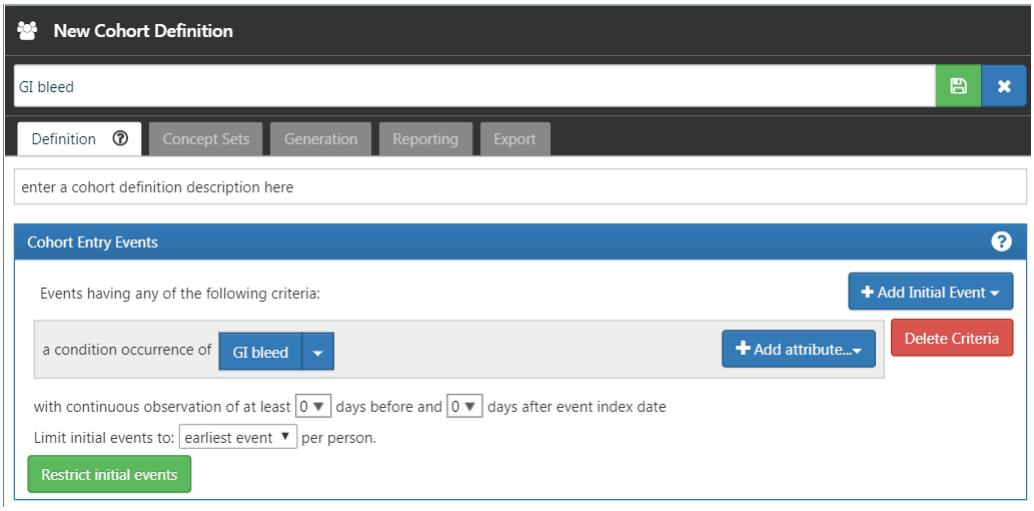


Figure 24.15: □□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□

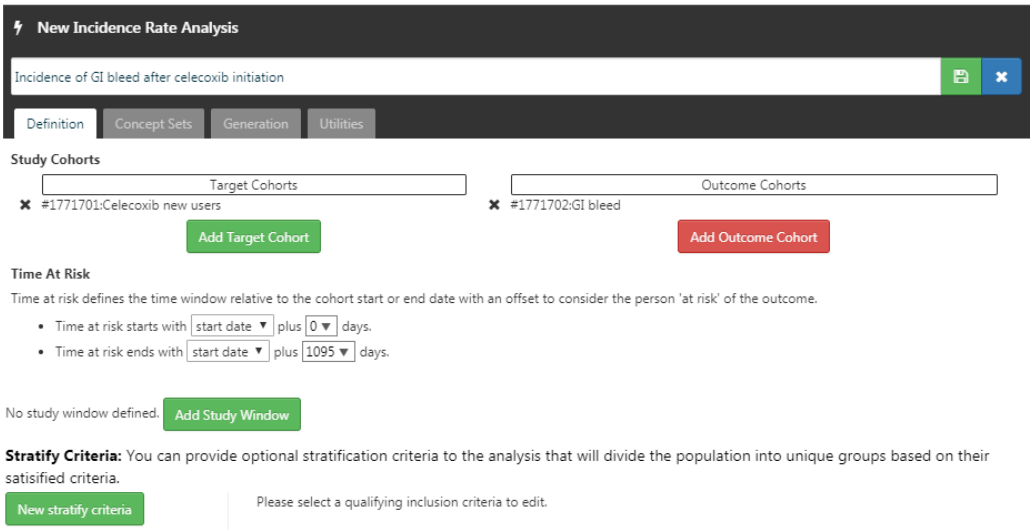


Figure 24.16: □□□□□□

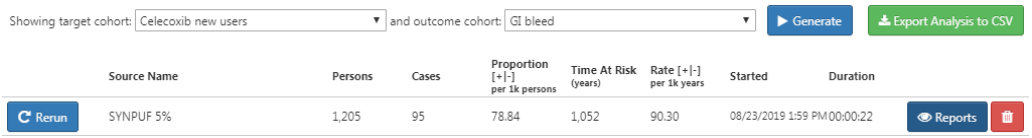


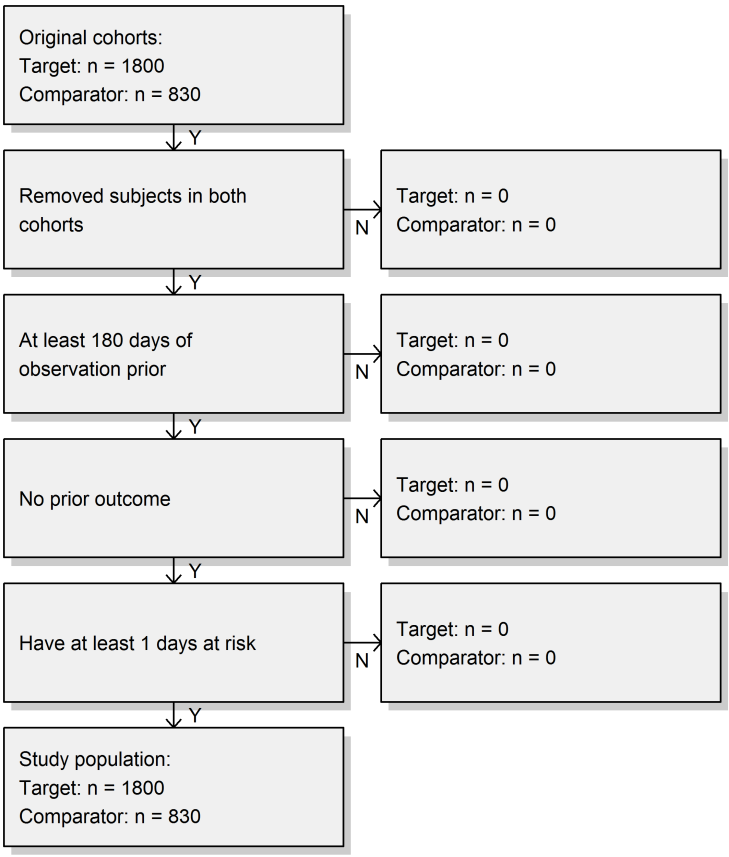
Figure 24.17: □□□□□

24.7

□□ 13.1

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□2□□□□□□□□□□□□□□□□□□□

```
studyPop <- createStudyPopulation(
  cohortMethodData = cmData,
  outcomeId = 3,
  washoutPeriod = 180,
  removeDuplicateSubjects = "remove all",
  removeSubjectsWithPriorOutcome = TRUE,
  riskWindowStart = 0,
  startAnchor = "cohort start",
  riskWindowEnd = 99999)
drawAttritionDiagram(studyPop)
```



□□□□□

```
model <- fitOutcomeModel(population = studyPop,
                         modelType = "cox")
model
```

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

□□□□□□□

□□ 13.5

□□□□□

```
##   TRUE
##     FALSE
##          FALSE
##    OK
##
##                 .95   .95
##          1.13211    0.92132    1.40008 0.12409    0.1068
```

□□□□□□□□□□□□□□□□□□□□□□□□□95□□□□□□□1□□□□□□□□□□□□□□□□□□□□□□□□□

24.8

□□ 14.1

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

```r
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
##
```

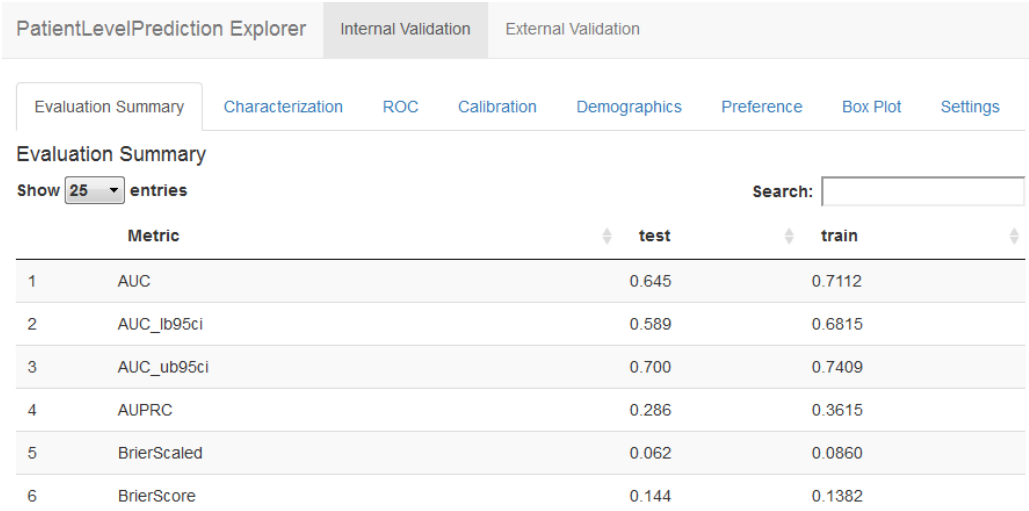
```
##
##
## 3          479        479
##
##
##     245
##       54079
```

□□ 14.2

□□□□□

```
viewPlp(lassoResults)
```

□□□□□□□24.18□□□□□□□□□□□□□□□□□□□□□□□□□□□□□AUC□0.645□□□□□□□



	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 24.18: □□□□□□□Shiny□□□□

24.9

□□ 16.1

ACHILLES□□□□□□□:

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

□□ 16.2

□□□□□□□□□□□□□□□□□□□□:

```
DataQualityDashboard::executeDqChecks(
  connectionDetails,
  cdmDatabaseSchema = "main",
  resultsDatabaseSchema = "main",
```

```
  cdmSourceName = "Eunomia",
  outputFolder = "C:/dataQualityExample")
```

□□ 16.3

□□□□□□□□□□□□□□□□□□□□:

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

24.10

24.11 NA

Bibliography

Allison, D. B., Brown, A. W., George, B. J., and Kaiser, K. A. (2016). Reproducibility: A tragedy of errors. *Nature*, 530(7588):27–29.

Arnold, B. F., Ercumen, A., Benjamin-Chung, J., and Colford, J. M. (2016). Brief Report: Negative Controls to Detect Selection Bias and Measurement Bias in Epidemiologic Studies. *Epidemiology*, 27(5):637–641.

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