

Deliverable 3 – Health Analytics Project Execution

Anti-Depressants Link to Heart Disease

Sergiy Palguyev

spalguv3@gatech.edu

1. Clinical Question

Do patients, above age 18, on SSRI anti-depressant medication have a higher risk of contracting heart disease than those who are not medicated?

2. Cohorts

Note: For the following Cohorts, the Antidepressant drug Concept Set was modified to include a larger pool of anti-depressant concepts.

2.1. Target Cohort Id # 233 – [spalguv3] Patients with depression and prescribed SSRIs

Target cohorts are patients with clinically diagnosed depression which are prescribed common anti-depressant medication such as SSRIs or SNRIs.

<http://gt-health-analytics-2.us-east-2.elasticbeanstalk.com/#/cohortdefinition/233>

The screenshot shows the Cohort #233 dashboard. At the top, it displays the cohort name: "[spalguv3] Patients with depression and prescribed SSRIs". Below this are several action buttons: a green 'Definition' button, a blue 'Concept Sets' button, a grey 'Generation' button (which is currently selected), a grey 'Reporting' button, a grey 'Export' button, and a grey 'Messages' button. To the right of these buttons are icons for a file, a magnifying glass, a refresh, a lock, and a trash can. The main content area is titled "Available CDM Sources" and contains a table with the following data:

Source Name	Generation Status	People	Records	Generated	Generation Duration	Action
CMSDESynPUF100k	COMPLETE	8,153	8,153	02/21/2020 11:10 PM	00:00:08	View Reports
CMSDESynPUF1k	n/a	n/a	n/a	n/a	n/a	View Reports
CMSDESynPUF23m	COMPLETE	187,708	187,708	02/21/2020 11:10 PM	00:00:24	View Reports

2.2. Comparator Cohort Id # 235 – [spalguv3] Patients with depression, not on SSRIs

Comparator Cohorts are patients with clinically diagnosed depression which are not prescribed any anti-depressant medication, instead receiving psychotherapy or other mode of treatment.

<http://gt-health-analytics-2.us-east-2.elasticbeanstalk.com/#/cohortdefinition/235>

Cohort #235

[spalguyev3] Patients with depression, not on SSRIs

Definition Concept Sets Generation Reporting Export Messages

Available CDM Sources

Source Name	Generation Status	People	Records	Generated	Generation Duration	
► Generate CMSDESynPUF100k	COMPLETE	2,379	2,379	02/21/2020 11:10 PM	00:00:10	<button>View Reports</button>
► Generate CMSDESynPUF1k	n/a	n/a	n/a	n/a	n/a	<button>View Reports</button>
► Generate CMSDESynPUF23m	COMPLETE	55,806	55,806	02/21/2020 11:10 PM	00:00:26	<button>View Reports</button>

2.3. Outcome Cohort Id #238 – [spalguyev3] Patients with occurrence of Heart Disease

The outcome cohort is patients who develop heart disease.

<http://gt-health-analytics-2.us-east-2.elasticbeanstalk.com/#/cohortdefinition/238>

Cohort #238

[spalguyev3] Patients with occurrence of Heart Disease

Definition Concept Sets Generation Reporting Export Messages

Available CDM Sources

Source Name	Generation Status	People	Records	Generated	Generation Duration	
► Generate CMSDESynPUF100k	COMPLETE	25,176	25,176	02/21/2020 10:31 PM	00:00:09	<button>View Reports</button>
► Generate CMSDESynPUF1k	n/a	n/a	n/a	n/a	n/a	<button>View Reports</button>
► Generate CMSDESynPUF23m	COMPLETE	593,629	593,629	02/21/2020 10:31 PM	00:00:14	<button>View Reports</button>

3. Incidence Rates Id #76 – [spalguyev3] Patients with depression with[out] SSRIs for Heart Disease

<http://gt-health-analytics-2.us-east-2.elasticbeanstalk.com/#/iranalysis/76>

Incidence Rate Analysis #76

[spalguyev3] Patients with depression with[out] SSRIs for Heart Disease

Definition Concept Sets Generation Utilities

Study Cohorts

Target Cohorts	Outcome Cohorts
✖ #233:[spalguyev3] Patients with depression and prescribed SSRIs	✖ #238:[spalguyev3] Patients with occurrence of Heart Disease
✖ #235:[spalguyev3] Patients with depression, not on SSRIs	

Add Target Cohort Add Outcome Cohort

Time At Risk

Time at risk defines the time window relative to the cohort start or end date with an offset to consider the person 'at risk' of the outcome.

- Time at risk starts with plus days.
- Time at risk ends with plus days.

No study window defined.

3.1. Patients with depression and prescribed SSRIs

The screenshot shows the 'Incidence Rate Analysis #76' interface. The target cohort is defined as '[spalguyev3] Patients with depression with[out] SSRIs for Heart Disease'. The outcome cohort is '[spalguyev3] Patients with occurrence of Hi'. The analysis has been generated and is ready to be exported to CSV.

Source Name	Persons	Cases	Proportion [+] per 1k persons	Time At Risk (years)	Rate [+] per 1k years	Started	Duration
C Rerun CMSDESynPUF100k	6,244	1,663	266.34	7,787	213.56	02/21/2020 11:20:00:15	Reports Delete
C Rerun CMSDESynPUF23m	143,948	38,622	268.31	180,060	214.50	02/21/2020 11:20:00:37	Reports Delete

3.2. Patients with depression and not on SSRIs

The screenshot shows the 'Incidence Rate Analysis #76' interface. The target cohort is defined as '[spalguyev3] Patients with depression, not [-] SSRIs for Heart Disease'. The outcome cohort is '[spalguyev3] Patients with occurrence of Hi'. The analysis has been generated and is ready to be exported to CSV.

Source Name	Persons	Cases	Proportion [+] per 1k persons	Time At Risk (years)	Rate [+] per 1k years	Started	Duration
C Rerun CMSDESynPUF100k	1,836	418	227.67	2,129	196.34	02/21/2020 11:20:00:15	Reports Delete
C Rerun CMSDESynPUF23m	41,975	10,494	250.01	47,773	219.66	02/21/2020 11:20:00:37	Reports Delete

4. Cohort Characterization Id #64 – [spalguyev3] SSRI vs not-SSRI treated patients for Heart Disease

<http://gt-health-analytics-2.us-east-2.elasticbeanstalk.com/#/cc/characterizations/64/design>

Characterization #64

[spalgu耶v3] SSRI vs not-SSRI treated patients for Heart Disease

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	Edit cohort	Remove
233	[spalgu耶v3] Patients with depression and prescribed SSRIs	Edit cohort	Remove
235	[spalgu耶v3] Patients with depression, not on SSRIs	Edit cohort	Remove

Showing 1 to 2 of 2 entries Previous 1 Next

Feature analyses

Import

Show 10 entries Search:

ID	Name	Description	Actions
10	Condition Era Any Time Prior	One covariate per condition in the condition_era table overlapping with any time prior to index.	Remove
71	Demographics Age Group	Age of the subject on the index date (in 5 year age groups)	Remove
74	Demographics Gender	Gender of the subject.	Remove
89	Drug Era Any Time Prior	One covariate per drug in the drug_era table overlapping with any time prior to index.	Remove

Showing 1 to 4 of 4 entries Previous 1 Next

4.1. All prevalence covariates

All prevalence covariates

Export Export comparison Show 10 entries Search:

Covariate	Explore	Concept ID	[spalgu耶v3] Patients with depression and prescribed SSRIs		[spalgu耶v3] Patients with depression, not on SSRIs		Std diff
			Count	Pct	Count	Pct	
Acetaminophen	Explore ▾	1125315	5,061	62.08%	215	9.04%	-0.6289
Hydrochlorothiazide	Explore ▾	974166	4,475	54.89%	186	7.82%	-0.5944
levothyroxine	Explore ▾	1501700	3,891	47.72%	147	6.18%	-0.5658
Oxygen	Explore ▾	19025274	3,275	40.17%	108	4.54%	-0.5328
Hydrocodone	Explore ▾	1174888	3,108	38.12%	90	3.78%	-0.5304
Simvastatin	Explore ▾	1539403	3,516	43.13%	144	6.05%	-0.5286
Metformin	Explore ▾	1503297	3,021	37.05%	83	3.49%	-0.5271
Lovastatin	Explore ▾	1592085	3,106	38.10%	102	4.29%	-0.5193
Omeprazole	Explore ▾	923645	2,751	33.74%	61	2.56%	-0.5174
Lisinopril	Explore ▾	1308216	3,202	39.27%	123	5.17%	-0.5115

Showing 1 to 10 of 2,013 entries Previous 1 2 3 4 5 ... 202 Next

4.2. Demographics Age Group

DEMOGRAPHICS / Demographics Age Group

Export | Export comparison | Show 10 entries | Search:

Covariate	Explore	Concept ID	[spalgu耶v3] Patients with depression and prescribed SSRIs		[spalgu耶v3] Patients with depression, not on SSRIs		Std diff ▾
			Count	Pct	Count	Pct	
45-49	N/A	0	304	3.73%	39	1.64%	-0.0902
50-54	N/A	0	346	4.24%	51	2.14%	-0.0831
70-74	N/A	0	1,358	16.66%	480	20.18%	0.0580
35-39	N/A	0	164	2.01%	24	1.01%	-0.0577
55-59	N/A	0	352	4.32%	68	2.86%	-0.0545
60-64	N/A	0	372	4.56%	76	3.19%	-0.0491
30-34	N/A	0	94	1.15%	14	0.59%	-0.0428
40-44	N/A	0	147	1.80%	26	1.09%	-0.0417
65-69	N/A	0	1,241	15.22%	416	17.49%	0.0396
75-79	N/A	0	1,203	14.76%	388	16.31%	0.0279

Showing 1 to 10 of 14 entries | Previous 2 Next

4.3. Demographic Gender

DEMOGRAPHICS / Demographics Gender

Export | Export comparison | Show 10 entries | Search:

Covariate	Explore	Concept ID	[spalgu耶v3] Patients with depression and prescribed SSRIs		[spalgu耶v3] Patients with depression, not on SSRIs		Std diff ▾
			Count	Pct	Count	Pct	
MALE	N/A	8507	3,199	39.24%	1,042	43.80%	0.0501
FEMALE	N/A	8532	4,954	60.76%	1,337	56.20%	-0.0422

Showing 1 to 2 of 2 entries | Previous Next

4.4. Condition Era Any Time Prior

CONDITION / Condition Era Any Time Prior

Export | Export comparison | Show 10 entries | Search:

Covariate	Explore	Concept ID	[spalgu耶v3] Patients with depression and prescribed SSRIs		[spalgu耶v3] Patients with depression, not on SSRIs		Std diff ▾
			Count	Pct	Count	Pct	
Schizoaffective schizophrenia	Explore ▾	432597	885	10.85%	58	2.44%	-0.2308
Actinic keratosis	Explore ▾	138825	1,409	17.28%	681	28.63%	0.1674
Neoplasm of uncertain behavior of skin	Explore ▾	135777	922	11.31%	489	20.55%	0.1638
Paranoid schizophrenia	Explore ▾	433450	544	6.67%	47	1.96%	-0.1597
Schizophrenia	Explore ▾	435783	601	7.37%	70	2.94%	-0.1379
Schizophriform disorder	Explore ▾	444434	240	2.94%	11	0.46%	-0.1344
Inflamed seborrheic keratosis	Explore ▾	40483107	526	6.45%	278	11.69%	0.1229
Bipolar disorder	Explore ▾	436665	1,284	15.75%	232	9.75%	-0.1187
Benign prostatic hypertrophy with outflow obstruction	Explore ▾	443211	852	10.45%	384	16.14%	0.1103
Simple schizophrenia	Explore ▾	436067	186	2.28%	11	0.46%	-0.1098

Showing 1 to 10 of 1,446 entries | Previous 2 3 4 5 ... 145 Next

4.5. Drug Era Any Time Prior



5. Estimation Study Analysis in RStudio Id #14 – [spalguyev3] SSRI vs non-SSRI treated patients for Heart Disease

<http://gt-health-analytics-2.us-east-2.elasticbeanstalk.com/#/estimation/cca/14>

5.1. Estimation Study Analysis – RStudio Power

Table 1a. Number of subjects, follow-up time (in years), number of outcome events, and event incidence rate (IR) per 1,000 patient years (PY) in the target ([spalguyev3] Patients with depression and prescribed SSRIs) and comparator ([spalguyev3] Patients with depression, not on SSRIs) group after propensity score adjustment, as well as the minimum detectable relative risk (MDRR). Note that the IR does not account for any stratification.

Target subjects	Comparator subjects	Target years	Comparator years	Target events	Comparator events	Target IR (per 1,000 PY)	Comparator IR (per 1,000 PY)	MDRR
6,220	1,825	8,461	2,277	1,753	445	207.18	195.35	1.15

Table 1b. Time (days) at risk distribution expressed as minimum (min), 25th percentile (P25), median, 75th percentile (P75), and maximum (max) in the target ([spalguyev3] Patients with depression and prescribed SSRIs) and comparator ([spalguyev3] Patients with depression, not on SSRIs) cohort after propensity score adjustment.

Cohort	Min	P10	P25	Median	P75	P90	Max
Target	1	100	245	488	850	907	1,093
Comparator	1	77	208	443	801	868	1,073

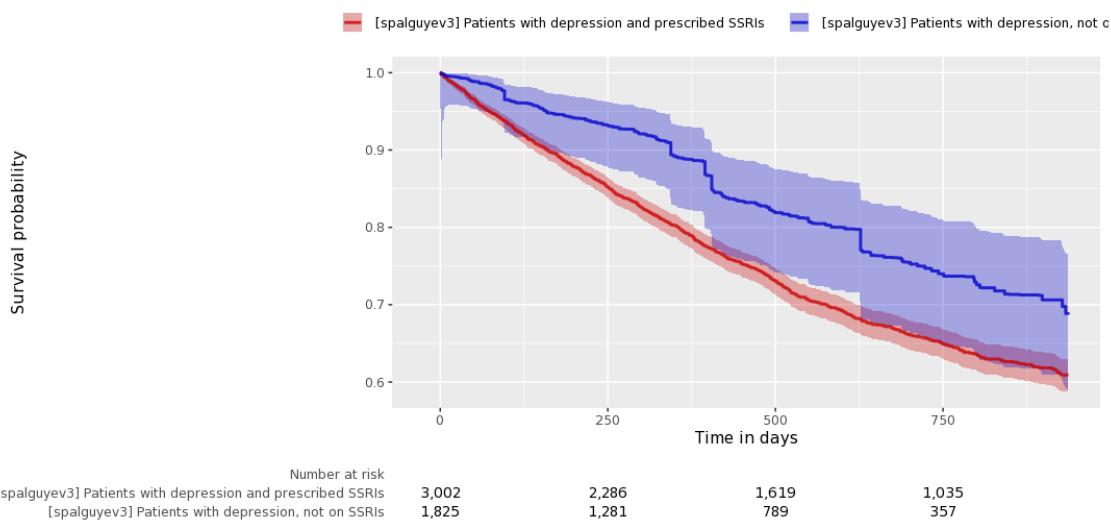


Figure 5. Kaplan Meier plot, showing survival as a function of time. This plot is adjusted using the propensity score: The target curve ([spalguyev3] Patients with depression and prescribed SSRIs) shows the actual observed survival. The comparator curve ([spalguyev3] Patients with depression, not on SSRIs) applies reweighting to approximate the counterfactual of what the target survival would look like had the target cohort been exposed to the comparator instead. The shaded area denotes the 95 percent confidence interval.

5.2. RStudio Attrition

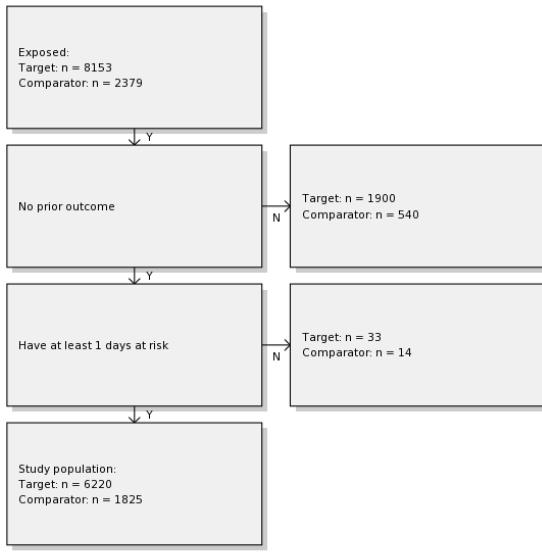


Figure 1. Attrition diagram, showing the Number of subjects in the target (*[spalgu耶v3] Patients with depression and prescribed SSRIs*) and comparator (*[spalgu耶v3] Patients with depression, not on SSRIs*) group after various stages in the analysis.

5.3. RStudio Population Characteristics

Table 2. Select characteristics before and after propensity score adjustment, showing the (weighted) percentage of subjects with the characteristics in the target (*[spalgu耶v3] Patients with depression and prescribed SSRIs*) and comparator (*[spalgu耶v3] Patients with depression, not on SSRIs*) group, as well as the standardized difference of the means.

Characteristic	Before PS adjustment			After PS adjustment		
	Target	Comparator		Target	Comparator	
	%	%	Std. diff	%	%	Std. diff
Age group						
25-29	0.9	0.4	0.06	0.9	0.3	0.07
30-34	1.2	0.6	0.06	1.3	0.5	0.09
35-39	2.0	1.0	0.08	2.0	1.5	0.04
40-44	1.8	1.1	0.06	1.8	0.9	0.08
45-49	3.7	1.6	0.13	3.4	3.1	0.02
50-54	4.2	2.1	0.12	4.1	3.2	0.05
55-59	4.3	2.9	0.08	4.2	3.7	0.02
60-64	4.6	3.2	0.07	4.8	3.0	0.09
65-69	15.2	17.5	-0.06	15.9	17.0	-0.03
70-74	16.7	20.2	-0.09	17.0	18.3	-0.03
75-79	14.8	16.3	-0.04	15.1	17.0	-0.05
80-84	13.3	14.2	-0.03	13.1	12.9	0.01
85-89	9.7	11.0	-0.04	9.7	9.3	0.01
90-94	4.0	4.6	-0.03	3.6	4.6	-0.05
95-99	3.2	2.7	0.03	2.7	3.1	-0.03
00-04	0.4	0.6	-0.02	0.3	1.5	-0.13
Gender: female	60.8	56.2	0.09	59.7	55.5	0.08
Race						
race = Black or African American	10.8	8.2	0.09	10.0	10.0	0.00
race = White	82.4	87.7	-0.15	83.5	85.3	-0.05
Ethnicity						
ethnicity = Hispanic or Latino	3.0	1.6	0.09	2.8	1.7	0.07
ethnicity = Not Hispanic or Latino	97.0	98.4	-0.09	97.2	98.3	-0.07

5.4. RStudio Propensity Scores

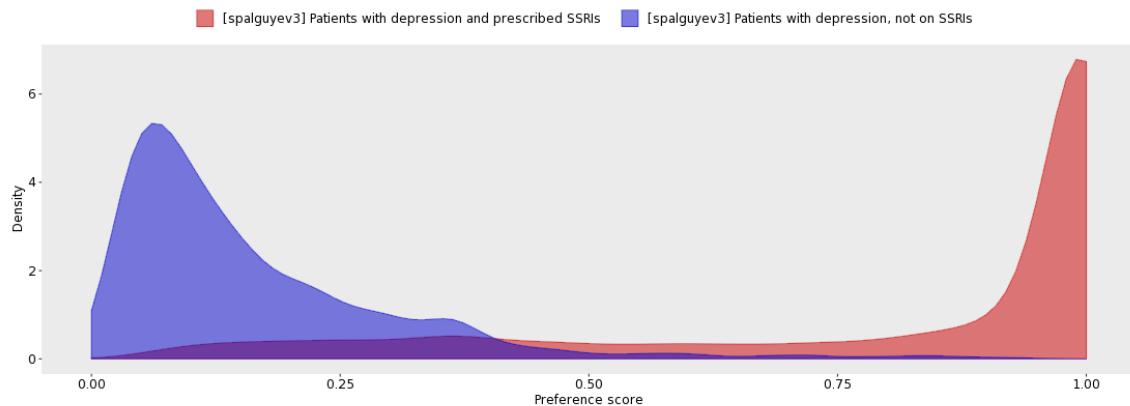


Figure 2. Preference score distribution. The preference score is a transformation of the propensity score that adjusts for differences in the sizes of the two treatment groups. A higher overlap indicates subjects in the two groups were more similar in terms of their predicted probability of receiving one treatment over the other.

5.5. RStudio Covariance Balance

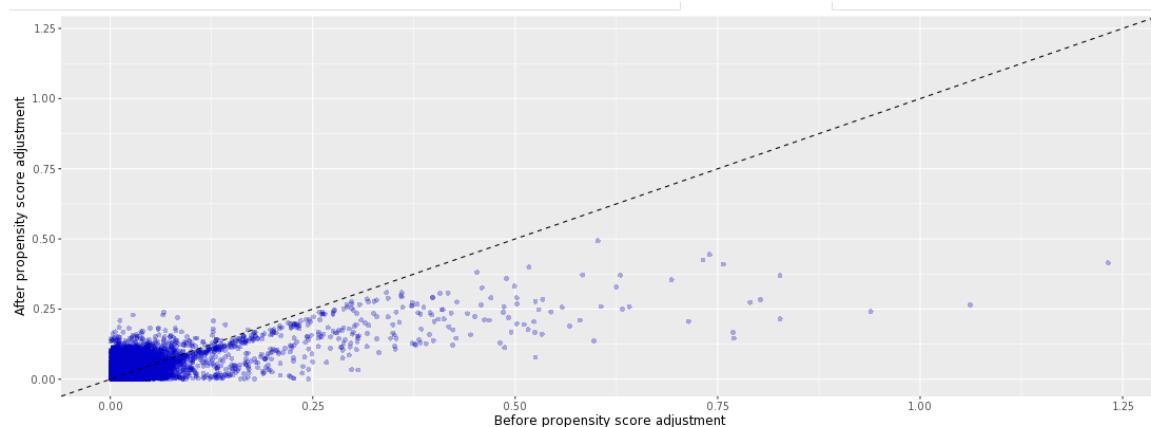


Figure 3. Covariate balance before and after propensity score adjustment. Each dot represents the standardized difference of means for a single covariate before and after propensity score adjustment on the propensity score. Move the mouse arrow over a dot for more details.