Deliverable 4 – Health Analytics Project Submission

Anti-Depressants Link to Heart Disease

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1. Introduction

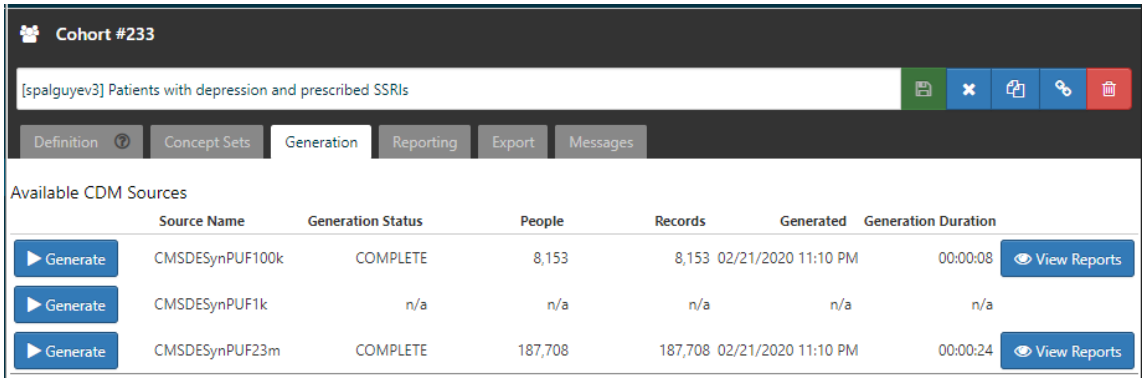
Depression and Heart Disease have been linked together for a long time. It is well known that depressed patients often suffer from heart disease, and conversely, patients with heart disease often suffer from depression. According to the Center for Disease Control, heart disease is the leading cause of death for people of all sexes and most racial groups in the United States. The disease accounts for 1 in every 4 deaths and is estimated to cost the United States approximately 2019 billion yearly in health care medicine and productivity costs [1]. Conversely, depression is one of the leading mental disorders in the United States, with almost 17.4 million people diagnosed [2]. The most common form of prescribed anti-depressants are selective serotonin reuptake inhibitors (SSRIs) and serotonin and norepinephrine reuptake inhibitors (SNRIs) [3]. Some studies point to over-prescribing of anti-depressants by almost 24% with almost 1 in 10 people taking an anti-depressant in the United States [4]. Anti-depressants are not the safest drugs. Most warnings cautioning against weight-gain, increase in depression or suicidal thoughts, or other psychological trouble.

What is not known, however, is whether the drugs which help curb depression contribute to an increased chance of heart disease. Thus, the clinical question being asked is: do patients, above age 18, on SSRI anti-depressant medication have a higher risk of contracting heart disease than those who are not medicated? My expectation is that SSRI anti-depressants most likely have slight statistical significance in contributing to heart disease in patients.

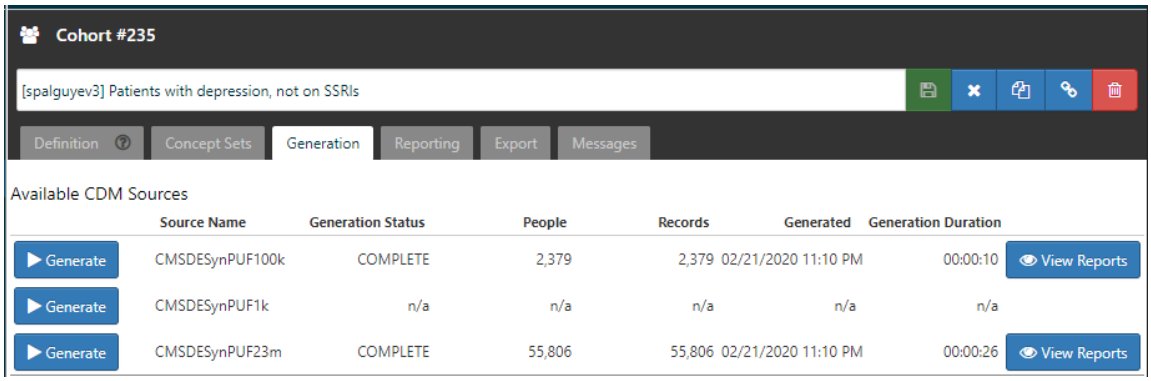
2. Methods

A sampling of SynPUF was conducted with patients above age 18. The data source is intended to simulate a realistic set of claims in order to allow application developers to create aps which may be easily applied to real patient data.

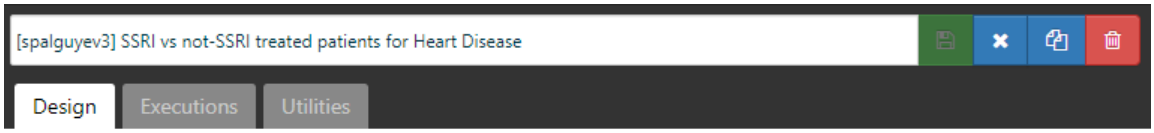
Target cohorts are patients with clinically diagnosed depression which are prescribed common anti-depressant medication such as SSRIs. This cohort consisted of patients with depression, concept defined as SNOMED code 191611001 and Antidepressants consisting of common SSRI drugs and antidepressants with Concept Codes (208149, 104849, CN609, CN600 and N06A).



Comparator Cohorts are patients with clinically diagnosed depression which are not prescribed any anti-depressant medication, consisting of the same concepts as the Target Cohorts with 0 occurrences of the antidepressants. The outcome cohort is patients who develop Chronic Ischemic Heart Disease with SNOMED code of 413838009.



In order to characterize the cohorts, the two Target and Comparator cohorts were analyzed for Condition Era Any Time Prior, Demographic Age Group, Demographics Gender and Drug Era Any Time Prior. The analysis was executed on SynPUF databases with 100k patients as well as 23mil patients.



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		
233	[spalguyev3] Patients with depression and prescribed SSRIs	Edit cohort	Remove
235	[spalguyev3] 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

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3. Results

The Incidence rates of patients with depression and taking SSRIs were found to be the following:

CMSDESynPUF100k

	Persons	Cases	Proportion [+|-] per 1k persons	Time At Risk (years)	Rate [+|-] per 1k years
Summary Statistics:	6,244	1,663	266.34	7,787	213.56

Stratify Rule	N	Cases	Proportion [+|-] per 1k persons	Time At Risk (years)	Rate [+|-] per 1k years

According to the patient characterization, it is evident that patients between the ages of 70-74 are the largest age group suffering depression, with both prescribed anti-depressants and without.

DEMOGRAPHICS / Demographics Age Group

Export | Export comparison | Show 25 entries | Search:

Covariate	Explore	Concept ID	[spalguyev3] Patients with depression and prescribed SSRIs		[spalguyev3] Patients with depression, not on SSRIs		Std diff
			Count	Pct	Count	Pct	
70-74	N/A	0	1,358	16.66%	480	20.18%	0.0580
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
80-84	N/A	0	1,083	13.28%	337	14.17%	0.0168
85-89	N/A	0	793	9.73%	261	10.97%	0.0274
60-64	N/A	0	372	4.56%	76	3.19%	-0.0491
55-59	N/A	0	352	4.32%	68	2.86%	-0.0545
50-54	N/A	0	346	4.24%	51	2.14%	-0.0831
90-94	N/A	0	325	3.99%	110	4.62%	0.0217
45-49	N/A	0	304	3.73%	39	1.64%	-0.0902
95-99	N/A	0	262	3.21%	65	2.73%	-0.0197
35-39	N/A	0	164	2.01%	24	1.01%	-0.0577
40-44	N/A	0	147	1.80%	26	1.09%	-0.0417
30-34	N/A	0	94	1.15%	14	0.59%	-0.0428

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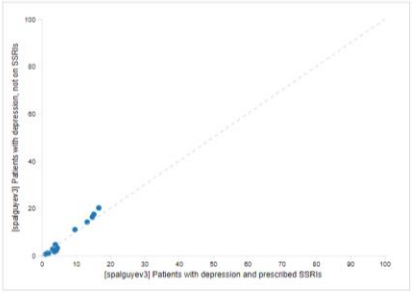

Similarly, there are more Female patients suffering from depression tha males.

Covariate	Explore	Concept ID	[spalguyev3] Patients with depression and prescribed SSRIs		[spalguyev3] Patients with depression, not on SSRIs		Std diff
			Count	Pct	Count	Pct	
FEMALE	N/A	8532	4,954	60.76%	1,337	56.20%	-0.0422
MALE	N/A	8507	3,199	39.24%	1,042	43.80%	0.0501

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Finally, RStudio was executed to analyze Population Level Effect Estimation. Based on the defined evaluation, the results are summarized as a Hazard Ratio of 1.30 with the 95% confidence interval Lower Bound of 1.12 and an Upper Bound of 1.50.

Analysis	Data source	HR	LB	UB	P	Cal.HR	Cal.LB	Cal.UB	Cal.P
New analysis 1	Synpuf	1.30	1.12	1.50	0.00	NA	NA	NA	NA

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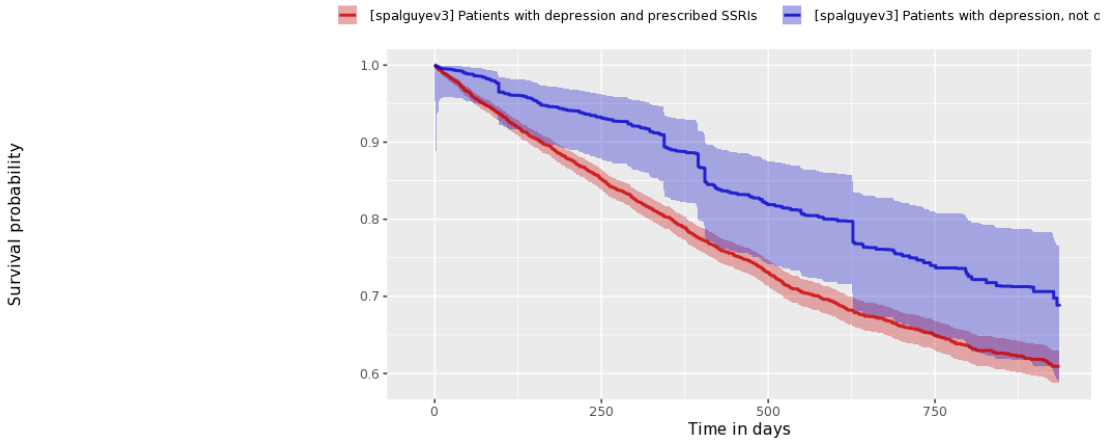
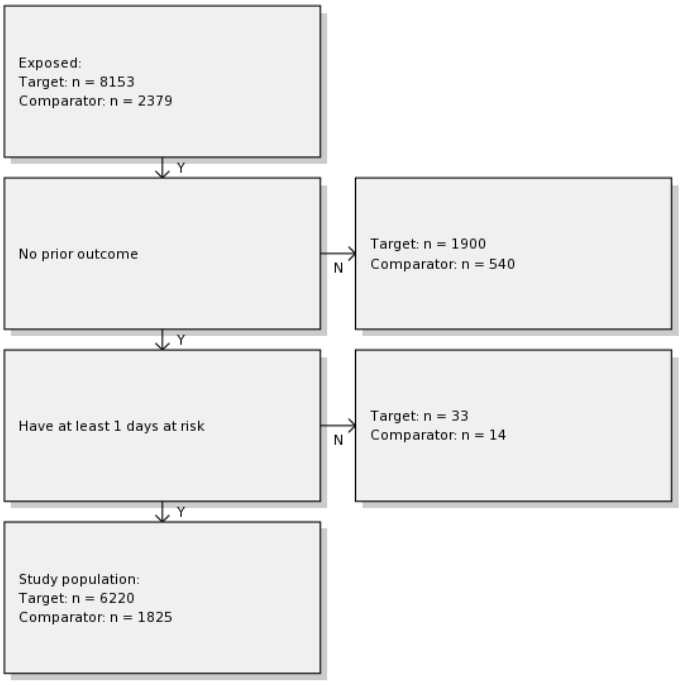
What these numbers signify is that the patients being treated for Depression are more likely to suffer from Heart Disease with statistical significance.

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



For the final study population, the Target population was 6220 patients with the Comparator population of 1825 patients.



4. Discussion

From the analysis, it is evident that patients with depression being treated with SSRI medication are a higher risk for heart disease than the patients which are not prescribed SSRIs. This finding is as expected, but also somewhat

surprising. Considering the statistical significance of this finding, it is surprising that there are not more warnings and cautions ascribed to SSRIs as they are overprescribed to multiple patients, sometimes without medical need for such prescriptions.

The limitations to the study outlined above are the narrow focus on antidepressant drugs as well as a broad range of depression and heart disease. Considering how there are many factors involved in such broad ranged diseases, further study is required to determine root cause of the statistical correlation of SSRIs to an increase in heart disease.

For follow-up work, it would be fascinating to characterize different common antidepressant drug alternatives to SSRIs (i.e. SNRIs) as well as their correlation to specific heart diseases such as .

5. Conclusion

This study explored two general cohorts of patients with clinical depression who do and do not use SSRIs to treat their symptoms. The patients were then observed for an increased chance of heart disease.

Although both heart disease and depression are wide ranging clinical diagnoses with an extensive amount of variation, this study demonstrated that there is significant statistical support to suggest that prescription SSRI medication does lead to an increase in the patient developing heart disease. This conclusion is a significant first step into leading further studies of both conditions as well as furthering the research into exact causes and effects of the over-perscription of anti-depressants on the rising number of heart disease patients in the United States.

6. References

[1] Heart Disease Facts. (2019, December 2). Retrieved from https://www.cdc.gov/heartdisease/facts.htm

[2] Cagliostro, D. (n.d.). Depression Central: Types, Causes, Symptoms, Statistics, & Treatment. Retrieved from https://www.psycom.net/depression.central.html