

## Deliverable 3 – Health Analytics Project Execution

### Anti-Depressants Link to Heart Disease

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#### 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?

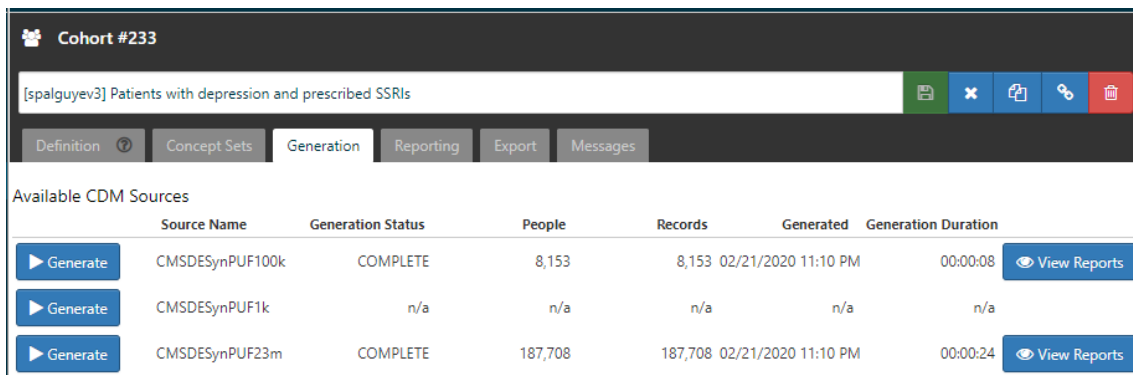
#### 2. Cohorts

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 – [spalguyev3] 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>



Cohort #233							
[spalguyev3] Patients with depression and prescribed SSRIs							
Definition ⓘ Concept Sets Generation Reporting Export Messages							
Available CDM Sources							
	Source Name	Generation Status	People	Records	Generated	Generation Duration	
▶ Generate	CMSDESynPUF100k	COMPLETE	8,153	8,153	02/21/2020 11:10 PM	00:00:08	View Reports
▶ Generate	CMSDESynPUF1k	n/a	n/a	n/a	n/a	n/a	
▶ Generate	CMSDESynPUF23m	COMPLETE	187,708	187,708	02/21/2020 11:10 PM	00:00:24	View Reports

##### 2.2. Comparator Cohort Id # 235 – [spalguyev3] 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	
<a href="#">Generate</a>	CMSDESynPUF100k	COMPLETE	2,379	2,379	02/21/2020 11:10 PM	00:00:10	<a href="#">View Reports</a>
<a href="#">Generate</a>	CMSDESynPUF1k	n/a	n/a	n/a	n/a	n/a	
<a href="#">Generate</a>	CMSDESynPUF23m	COMPLETE	55,806	55,806	02/21/2020 11:10 PM	00:00:26	<a href="#">View Reports</a>

### 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	
<a href="#">Generate</a>	CMSDESynPUF100k	COMPLETE	25,176	25,176	02/21/2020 10:31 PM	00:00:09	<a href="#">View Reports</a>
<a href="#">Generate</a>	CMSDESynPUF1k	n/a	n/a	n/a	n/a	n/a	
<a href="#">Generate</a>	CMSDESynPUF23m	COMPLETE	593,629	593,629	02/21/2020 10:31 PM	00:00:14	<a href="#">View Reports</a>

### 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 ✖ #233:[spalguyev3] Patients with depression and prescribed SSRIs ✖ #235:[spalguyev3] Patients with depression, not on SSRIs <a href="#">Add Target Cohort</a>	Outcome Cohorts ✖ #238:[spalguyev3] Patients with occurrence of Heart Disease <a href="#">Add Outcome Cohort</a>
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 <input type="text" value="start date"/> plus <input type="text" value="0"/> days. • Time at risk ends with <input type="text" value="start date"/> plus <input type="text" value="730"/> days.	
No study window defined. <a href="#">Add Study Window</a>	

### 3.1. Patients with depression and prescribed SSRIs

**Incidence Rate Analysis #76**

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

Definition Concept Sets **Generation** Utilities

Showing target cohort: [spalguyev3] Patients with depression and and outcome cohort: [spalguyev3] Patients with occurrence of Hi

Generate Export Analysis to CSV

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

### 3.2. Patients with depression and not on SSRIs

**Incidence Rate Analysis #76**

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

Definition Concept Sets **Generation** Utilities

Showing target cohort: [spalguyev3] Patients with depression, not and outcome cohort: [spalguyev3] Patients with occurrence of Hi

Generate Export Analysis to CSV

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

## 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

[spalguyev3] SSRI vs not-SSRI treated patients for Heart Disease

DesignExecutionsUtilities

**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

Previous1Next

### 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

Previous1Next

## 4.1. All prevalence covariates

All prevalence covariates

ExportExport comparison

Show 10 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	
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

Previous12345...202Next

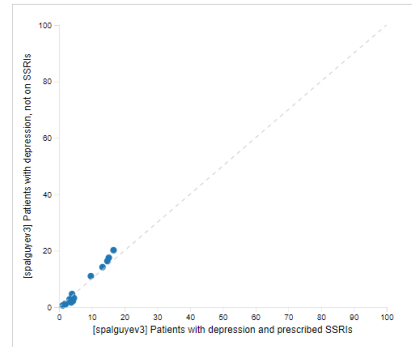
## 4.2. Demographics Age Group

#### DEMOGRAPHICS / Demographics Age Group

Export Export comparison Show 10 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	
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 1 2 Next



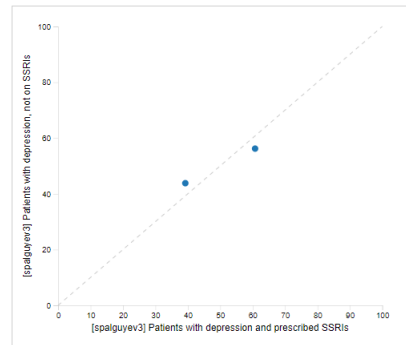
### 4.3. Demographic Gender

#### DEMOGRAPHICS / Demographics Gender

Export Export comparison Show 10 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	
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 1 Next



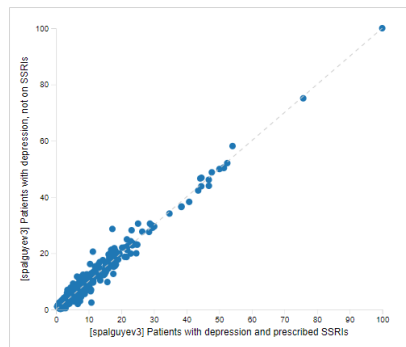
### 4.4. Condition Era Any Time Prior

#### CONDITION / Condition Era Any Time Prior

Export Export comparison Show 10 entries Search:

Covariate	Explore	Concept ID	[spalguyev3] Patients with depression and prescribed SSRIs		[spalguyev3] 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	1.98%	-0.1597
Schizophrenia	Explore	435783	601	7.37%	70	2.94%	-0.1379
Schizophreniform 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 1 2 3 4 5 ... 145 Next



### 4.5. Drug Era Any Time Prior

DRUG / Drug Era Any Time Prior

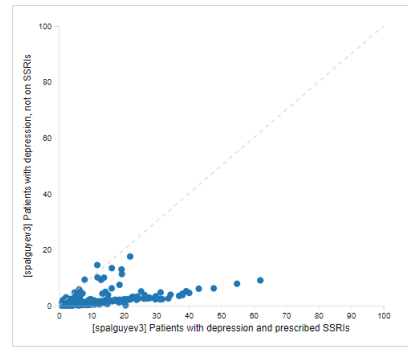
Export Export comparison Show 10 entries

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	
Acetaminophen	Explore	1125315	5,061	62.06%	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
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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 551 entries

Previous 1 2 3 4 5 ... 56 Next



## 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>

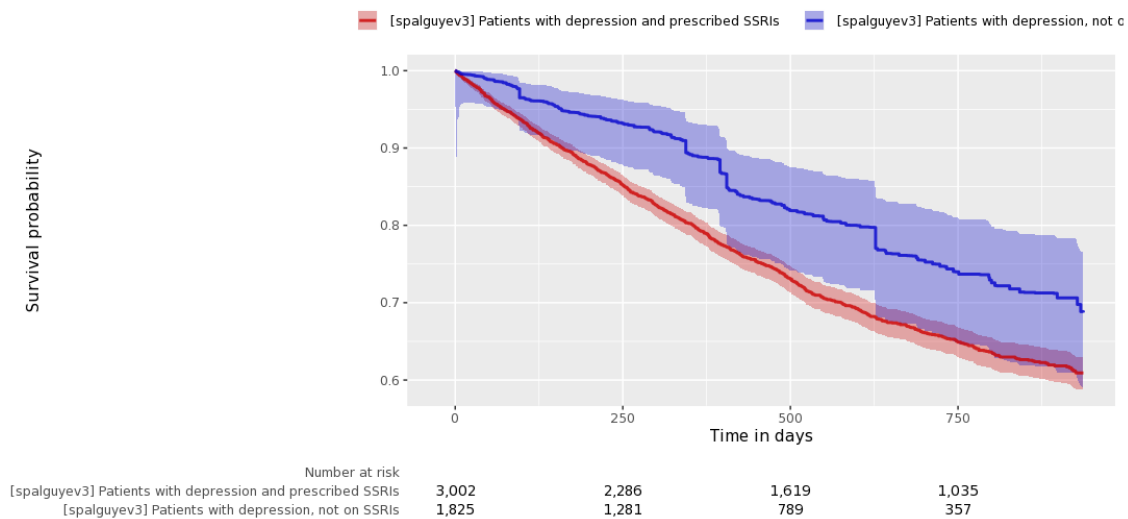
### 5.1. Estimation Study Analysis – RStudio Power

**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

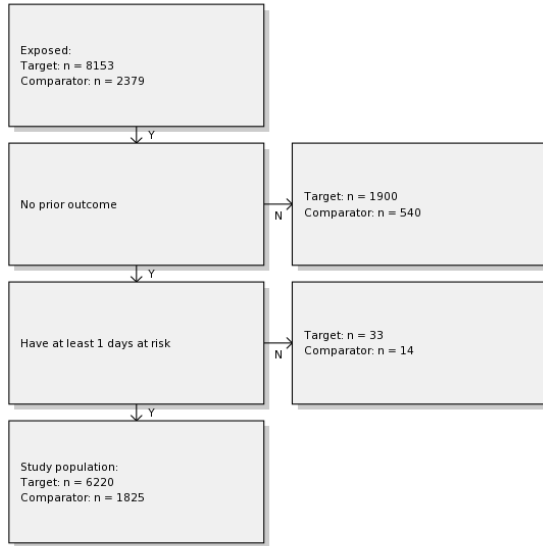
**Table 1b.** Time (days) at risk distribution expressed as minimum (min), 25th percentile (P25), median, 75th percentile (P75), and maximum (max) in the target ([spalguyev3] Patients with depression and prescribed SSRIs) and comparator ([spalguyev3] Patients with depression, not on SSRIs) cohort after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



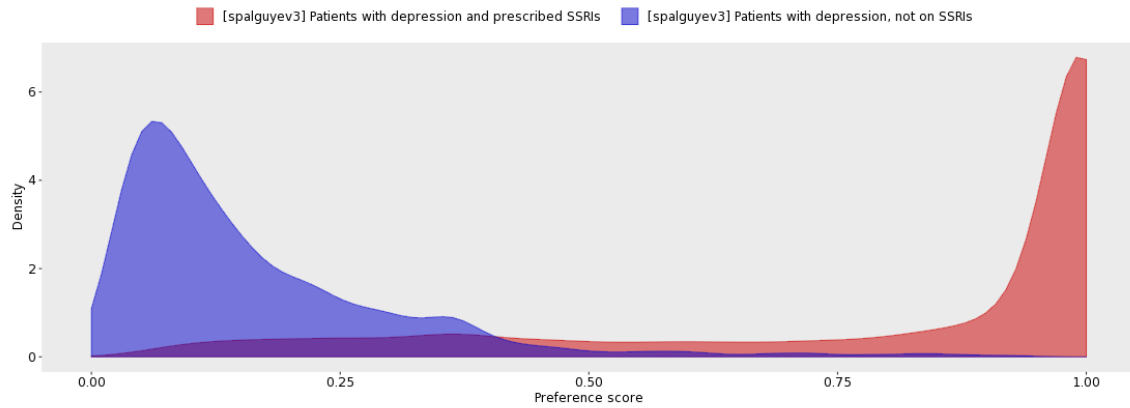
**Figure 1.** Attrition diagram, showing the Number of subjects in the target ([spalguyev3] Patients with depression and prescribed SSRIs) and comparator ([spalguyev3] Patients with depression, not on SSRIs) group after various stages in the analysis.

## 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 ([spalguyev3] Patients with depression and prescribed SSRIs) and comparator ([spalguyev3] Patients with depression, not on SSRIs) group, as well as the standardized difference of the means.

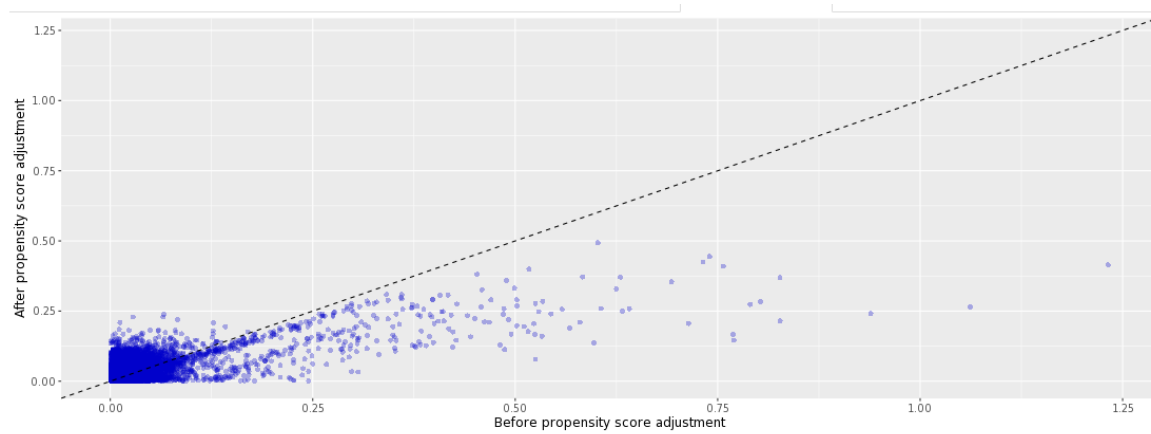
Characteristic	Before PS adjustment			After PS adjustment		
	Target	Comparator		Target	Comparator	
	%	%	Std. diff	%	%	Std. diff
Age group						
25-29	0.9	0.4	0.06	0.9	0.3	0.07
30-34	1.2	0.6	0.06	1.3	0.5	0.09
35-39	2.0	1.0	0.08	2.0	1.5	0.04
40-44	1.8	1.1	0.06	1.8	0.9	0.08
45-49	3.7	1.6	0.13	3.4	3.1	0.02
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.