

Decoding the Propensity of Hospital Admission Rates of Diabetic Customers

Analyzing a clinical database of 99,000 Patient records

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Slicer Menu

Demographics

Readmission analysis

Readmission analysis 2

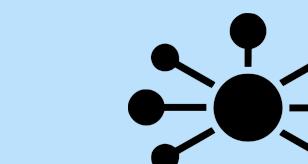
Serum impact

Relations

Diagnostics

Medicine impact

Statistical inference



Patients

99492



Males

45917

Females

53575



Readmission

46176



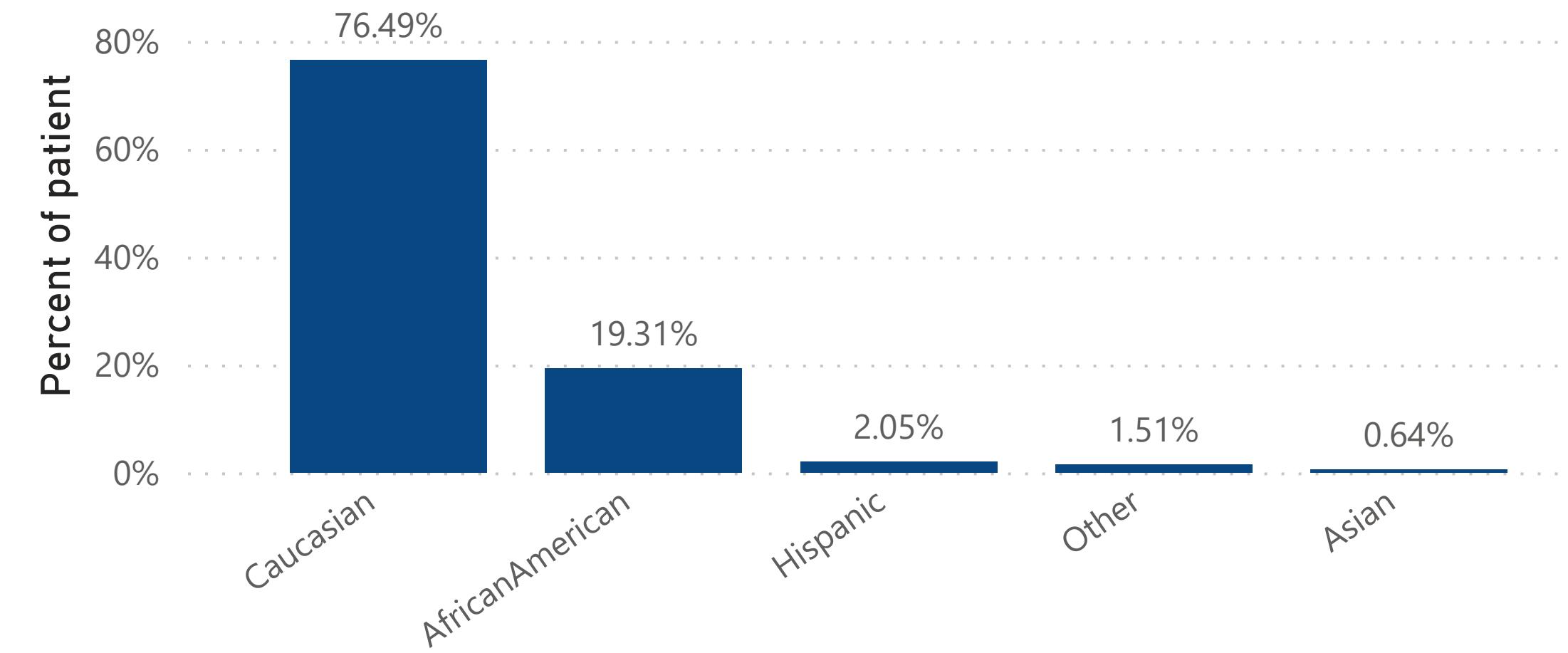
No Readmission

53316

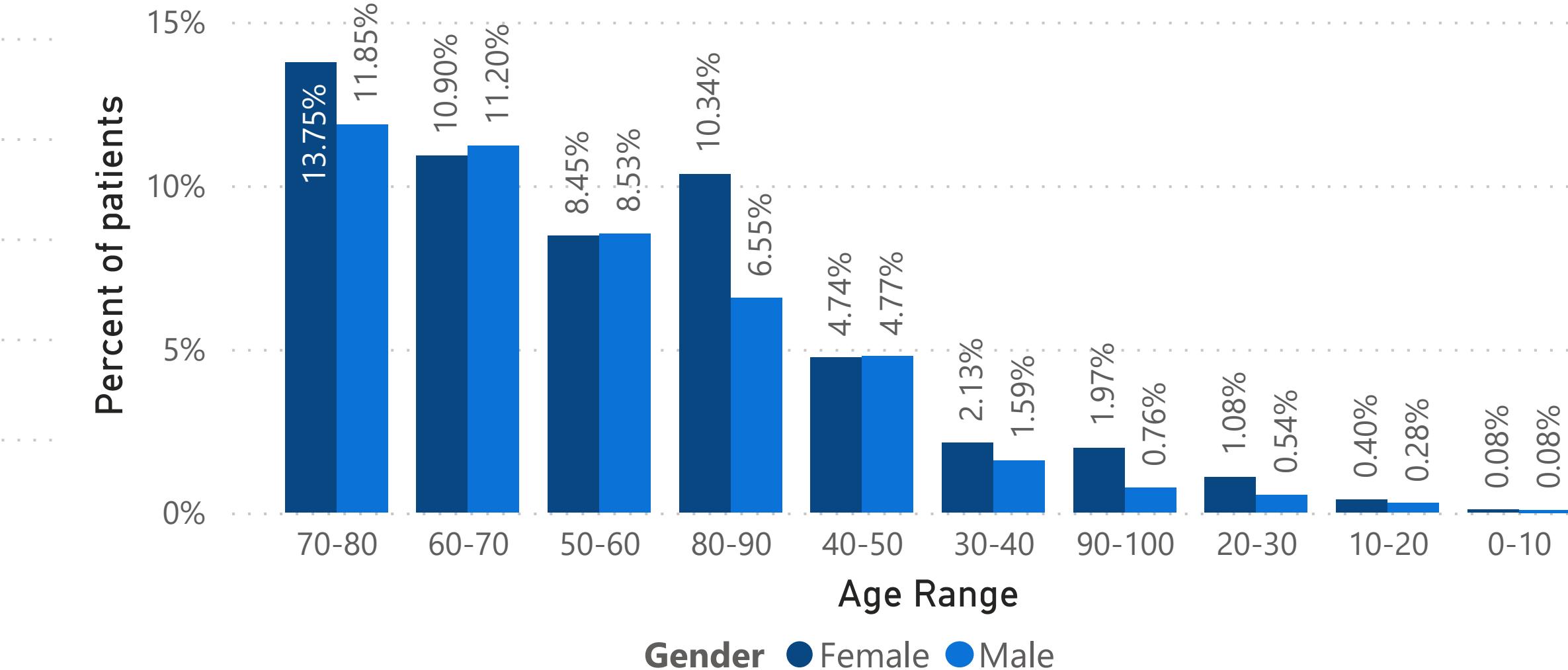
PATIENT DEMOGRAPHICS ANALYSIS

- Database of 99k Diabetic Patients obtained for a hospital in Ohio with information from the Serner system, used globally in developed markets for patient history management
- 76% of the patients are Caucasian and 19% African Americans; 77% of the base over 50 years age; Data fairly evenly distributed with 53% of the patients females and 47% Males
- Higher Rate of Patients getting admitted in Emergency scenario than a planned admission / physician referral - 45% customers getting admitted in emergency are >50 years

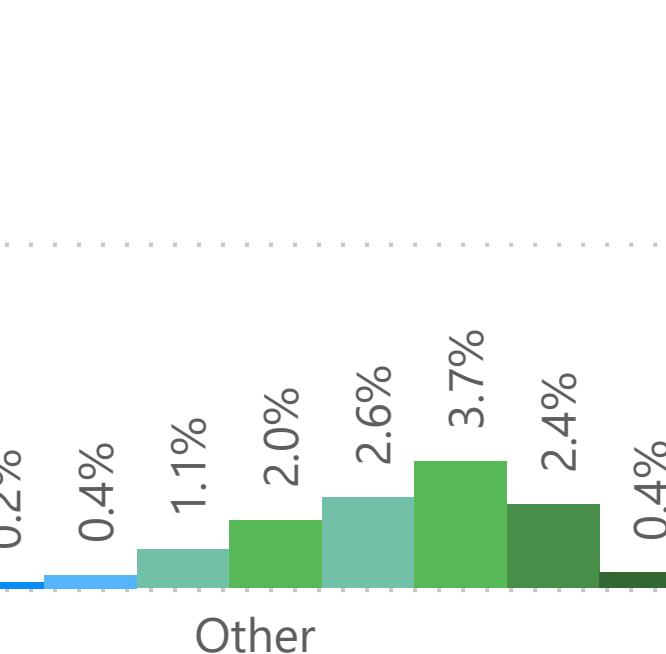
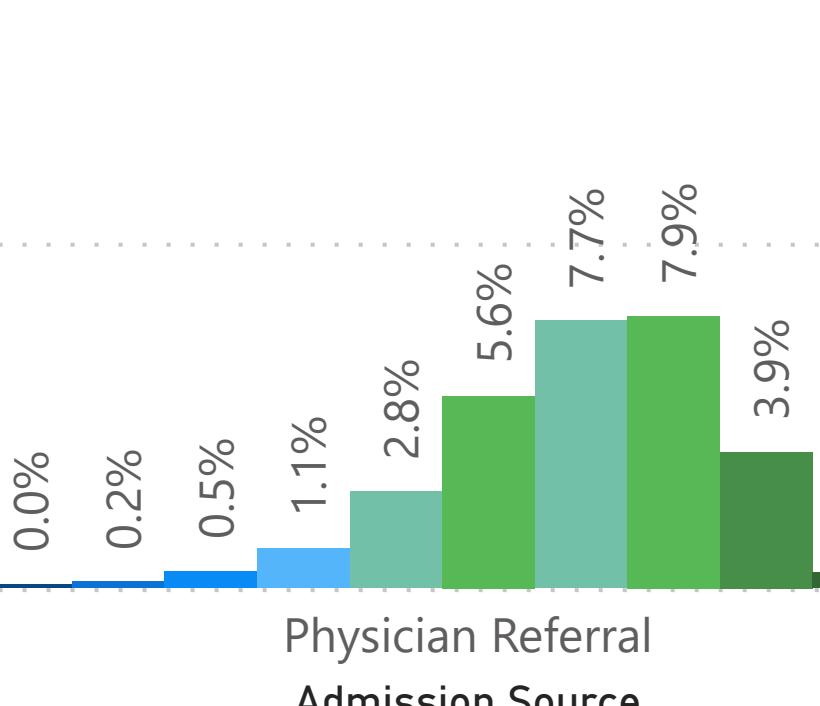
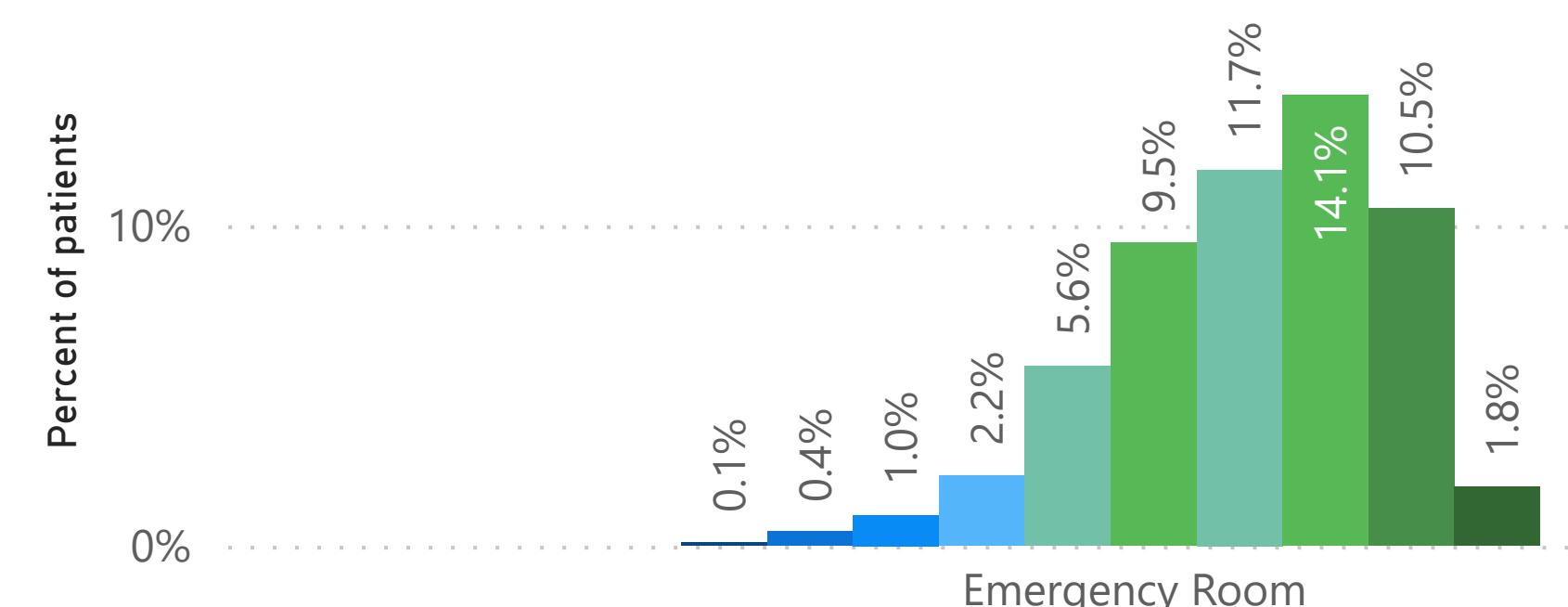
Percent of patient by Race



Patient relation between Age range on Gender



Patient relation of Age Range with Admission source



Age Range ● 0-10 ● 10-20 ● 20-30 ● 30-40 ● 40-50 ● 50-60 ● 60-70 ● 70-80 ● 80-90 ● 90-100

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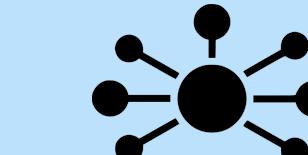
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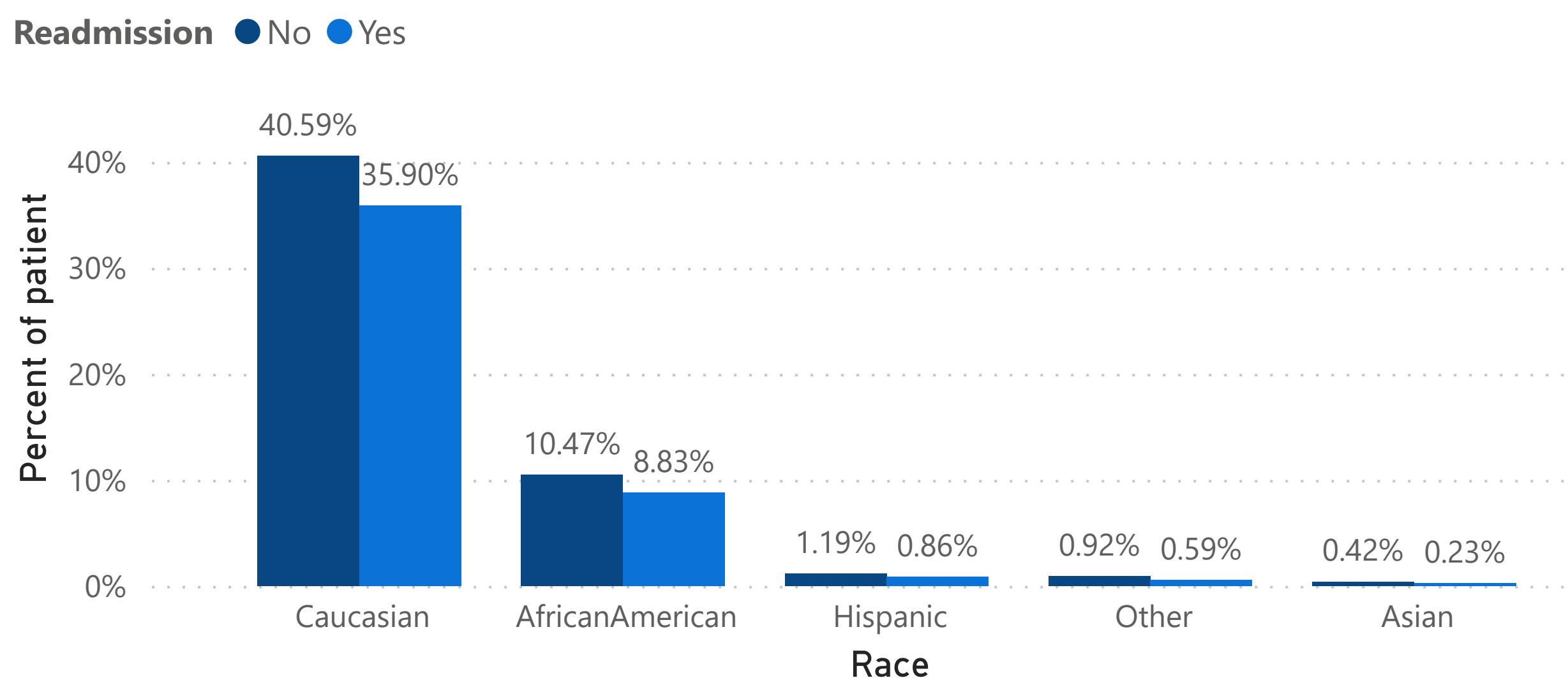
Statistical inference



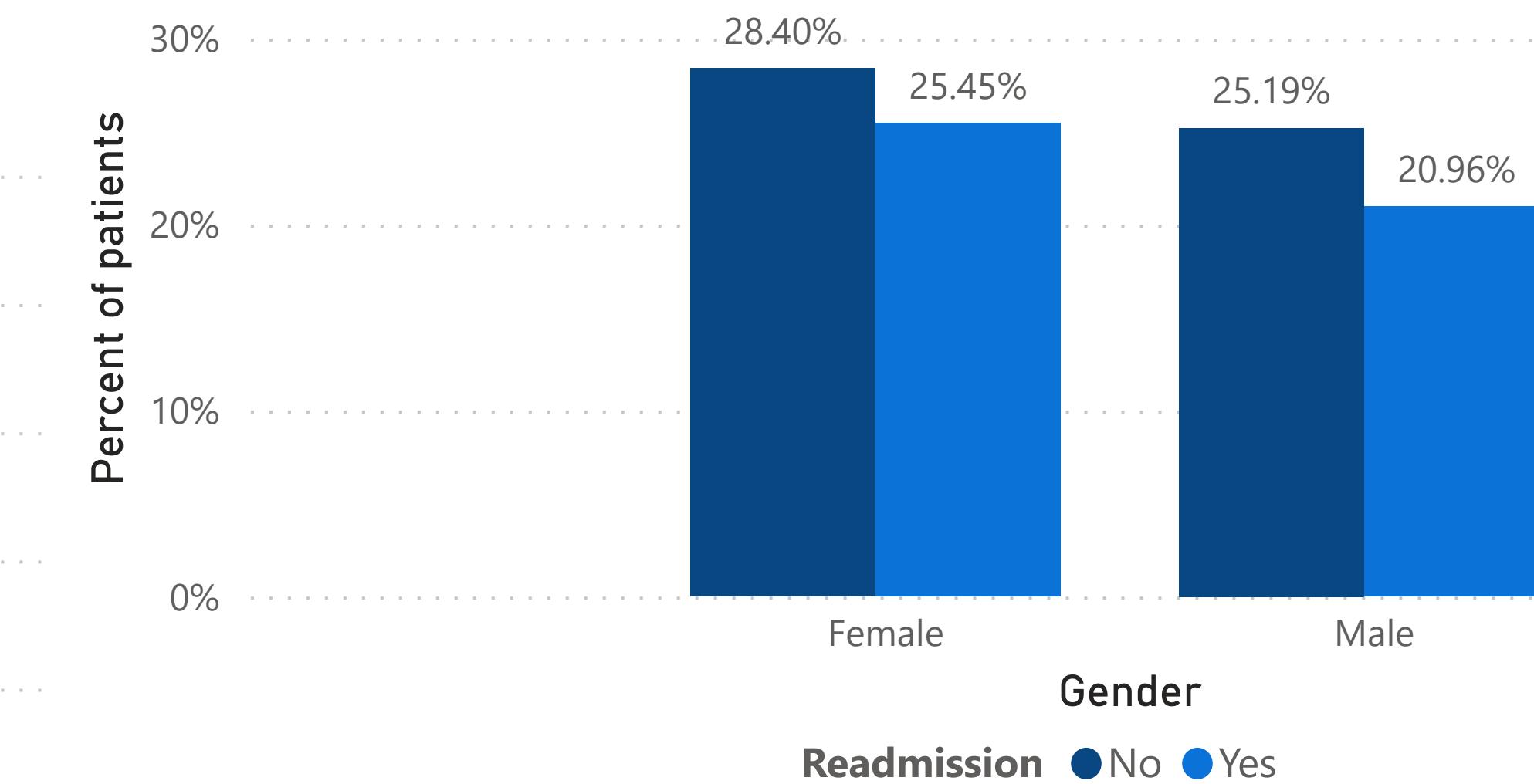
PATIENT DEMOGRAPHICS ANALYSIS

- Caucasians patients have a high readmission rate of 35.9% and females contribute to over 25% of readmissions
- Higher age bands of over 50 years contribute to over 43% re-admissions

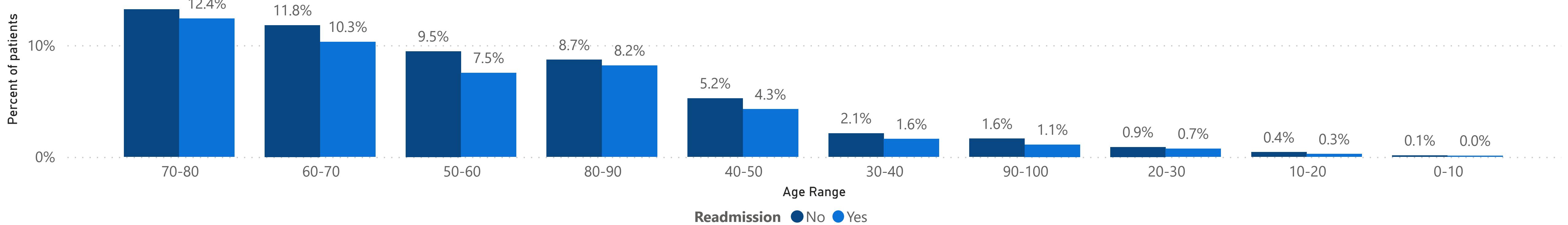
Patient Readmission rates by Race



Patient Readmission rates by Gender



Patient Readmission rates by Age



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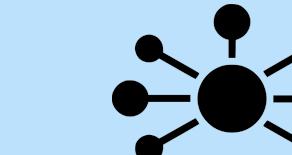
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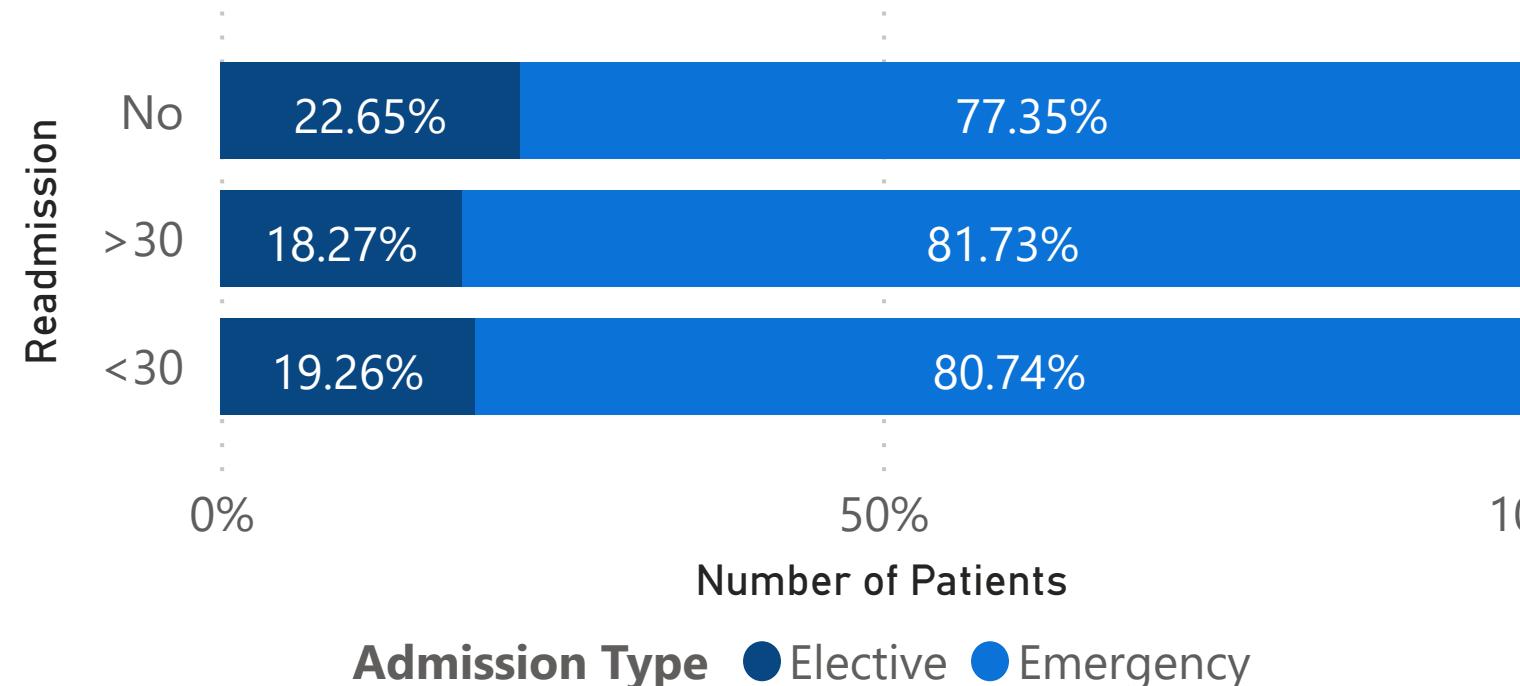
Statistical inference



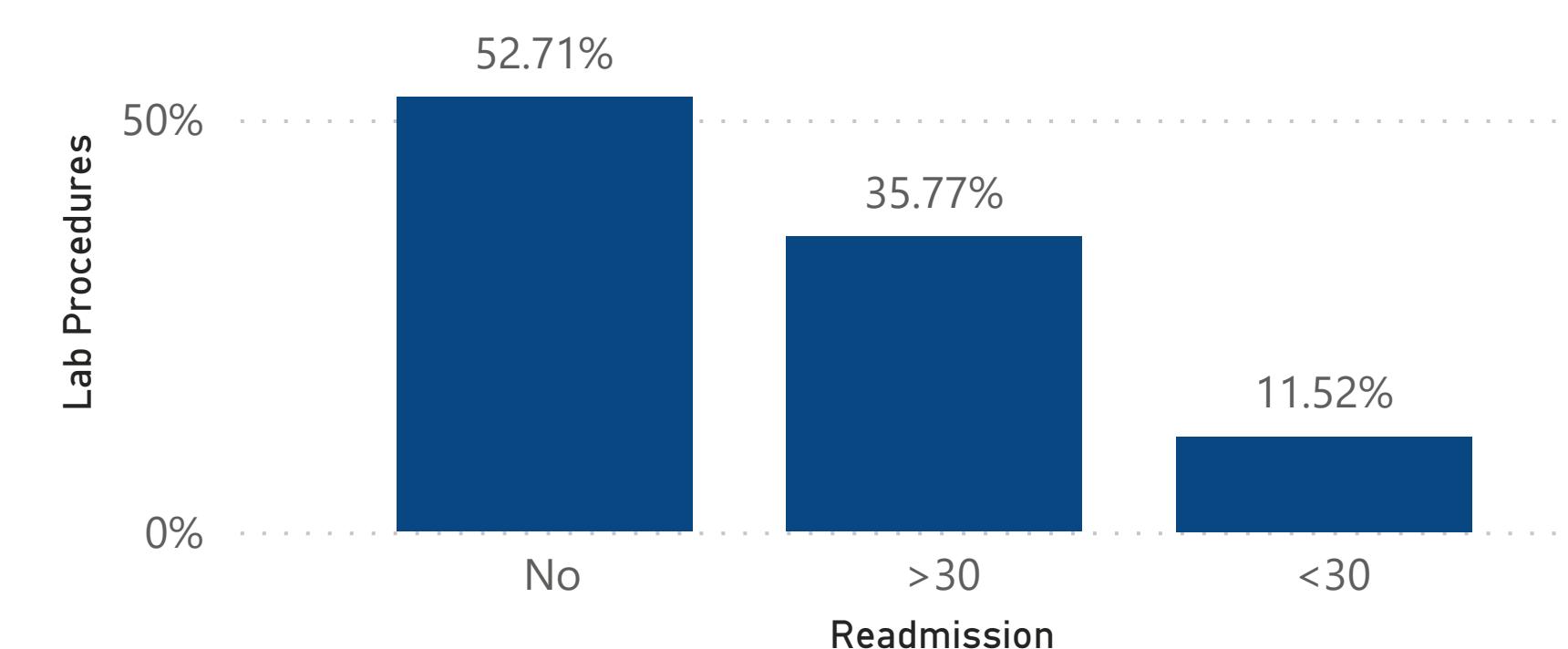
PATIENT READMISSION ANALYSIS - High Readmission for OPD and IN-Patient Visits

- 16.5% of the patients (16,500) made OPD visits of which 58% patients were readmitted within the year; 33.6% were Inpatient visits (33681) of which 60% were readmitted within one year
- Re admissions are high (>80%) via the Emergency route vis a vis Elective bookings made through the doctor
- Lab Vs. Non Lab procedures both impact readmission by ~46%

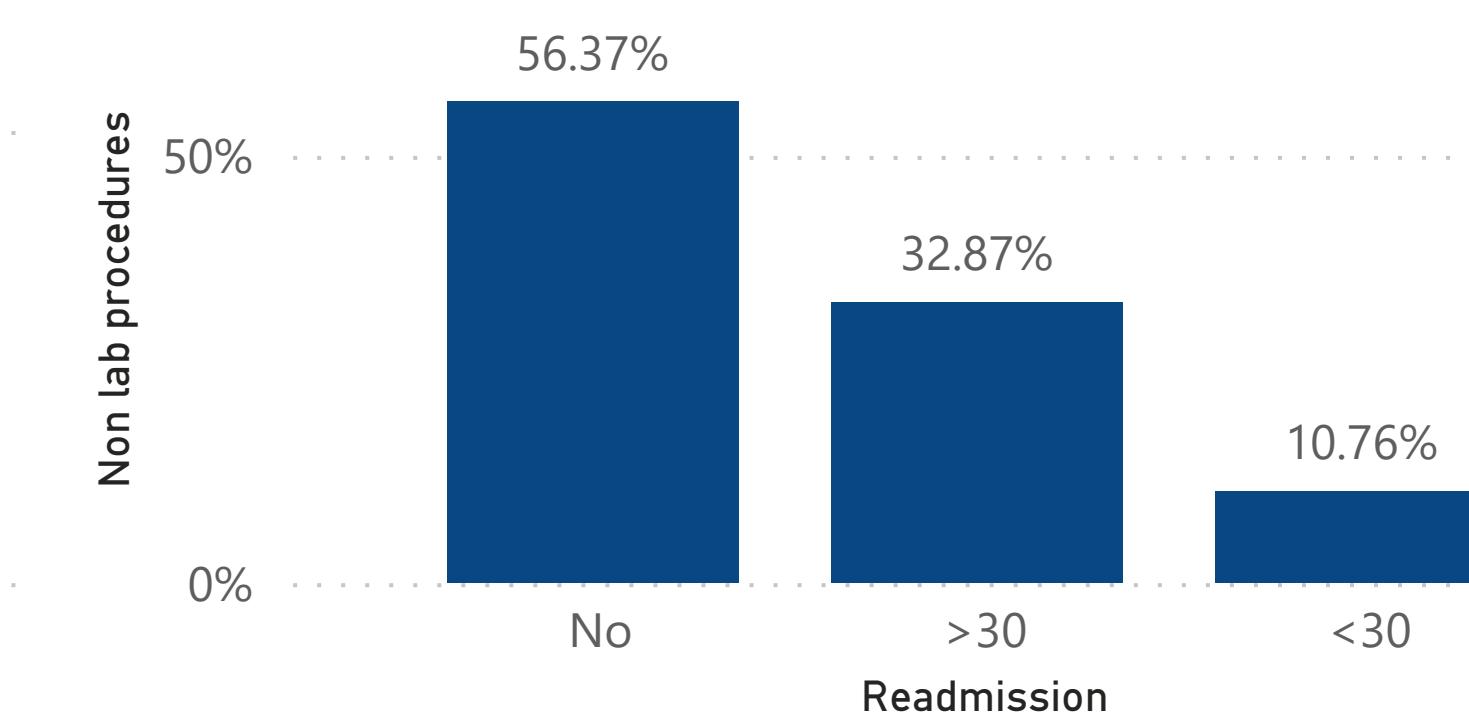
Relation between Readmission and Admission Type



Lab Procedures by Readmission



Non lab procedures by Readmission



Patient Readmission analysis

Age Range	Patients	OPDs Visitors	With in 30days	After 30days	No Readmit	Inpatient Visitors	With in 30days	After 30days	No Readmit
0-10	160	2	0.01%		0.01%	12	0.00%	0.01%	0.02%
10-20	682	60	0.04%	0.16%	0.17%	180	0.06%	0.27%	0.20%
20-30	1611	251	0.38%	0.58%	0.56%	591	0.52%	0.78%	0.45%
30-40	3699	511	0.44%	1.27%	1.39%	1214	0.77%	1.72%	1.12%
40-50	9465	1431	1.35%	3.76%	3.56%	3115	1.67%	4.51%	3.07%
50-60	16895	2676	1.92%	7.35%	6.95%	5410	2.57%	7.57%	5.92%
60-70	21988	3874	3.21%	10.71%	9.56%	7331	3.61%	9.94%	8.22%
70-80	25468	4372	3.62%	12.23%	10.65%	8863	4.22%	11.34%	10.76%
80-90	16800	2944	2.42%	7.99%	7.42%	6054	2.78%	7.65%	7.54%
90-100	2724	270	0.21%	0.70%	1.20%	211	0.28%	0.05%	1.27%
Total	99492	16500	13.68%	44.84%	41.47%	33681	16.59%	44.73%	38.67%

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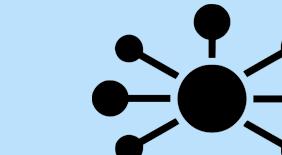
Serum impact

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IMPACT OF SERUM LEVELS AND HbA1c ON READMISSIONS

- Serum level refers to the effect of the prolonged medication administered and obtained by suitable blood tests.
- Analysis shows an inverse relationship between Glucose Serum Levels and Readmission. In scenarios of low serum levels, the chance of readmission is seen to be higher.
- HbA1c tests reflect the average blood sugar levels in a prolonged 2-3 month period. Higher HbA1c has a direct relationship with re-admissions.

Key influencers Top segments



What influences Readmitted to be No ?

When...

Glipizide Metformin is No

....the likelihood of Readmitted being No increases by

Infinity

Acarbose is No

Rosiglitazone is Down

Pioglitazone is Down

Glyburide Metformin is No

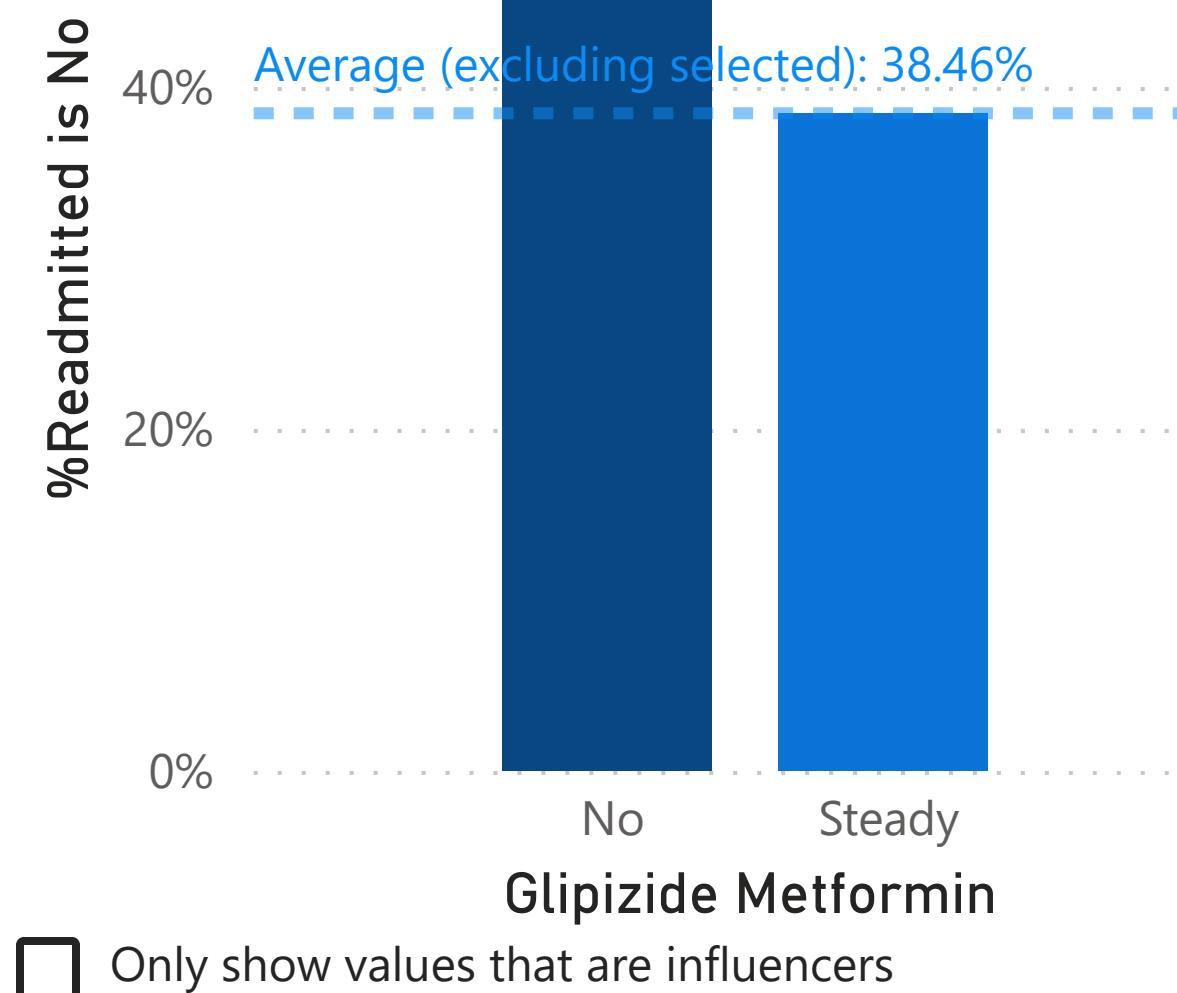
1.37x

1.30x

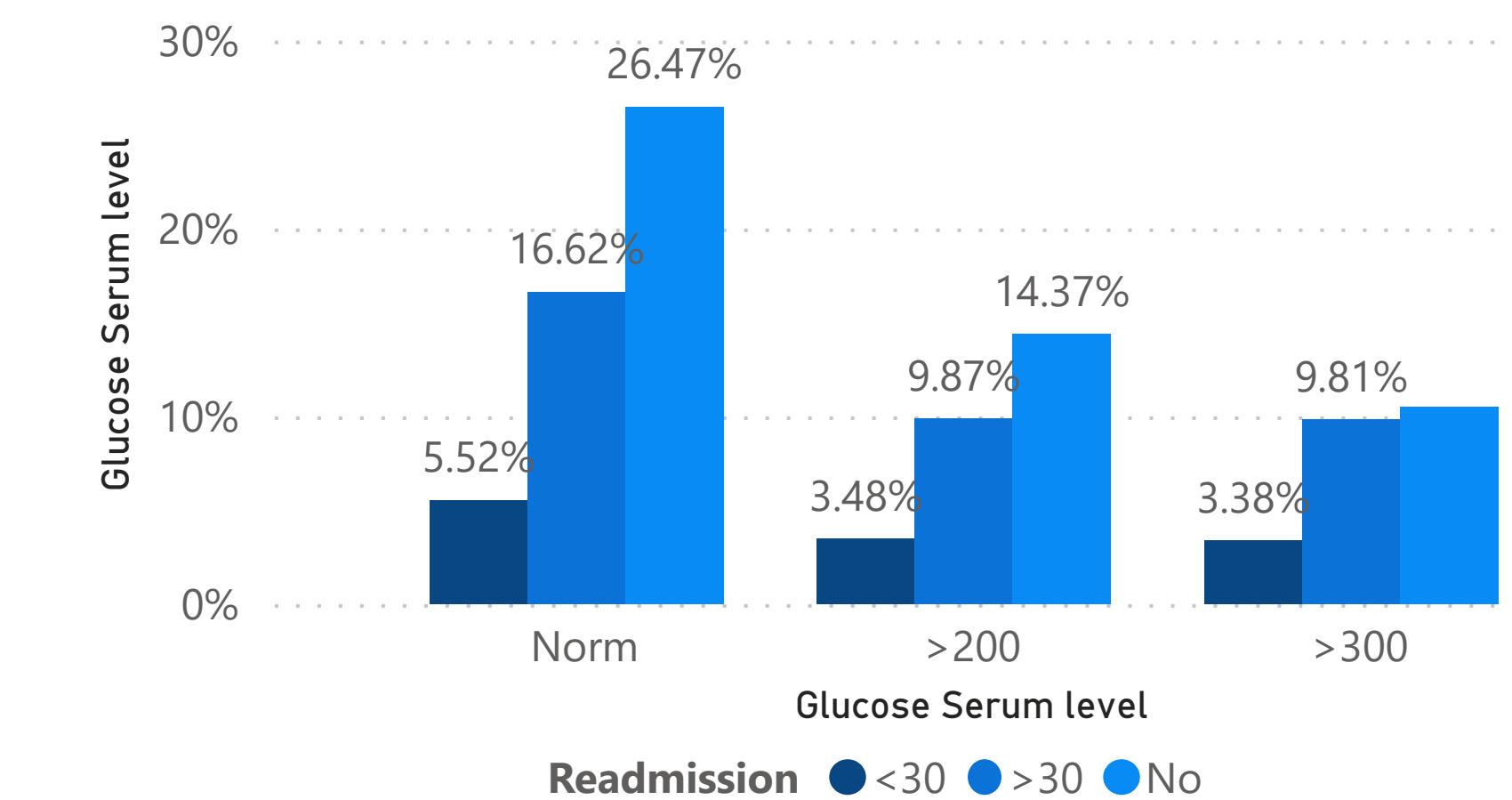
1.23x

1.21x

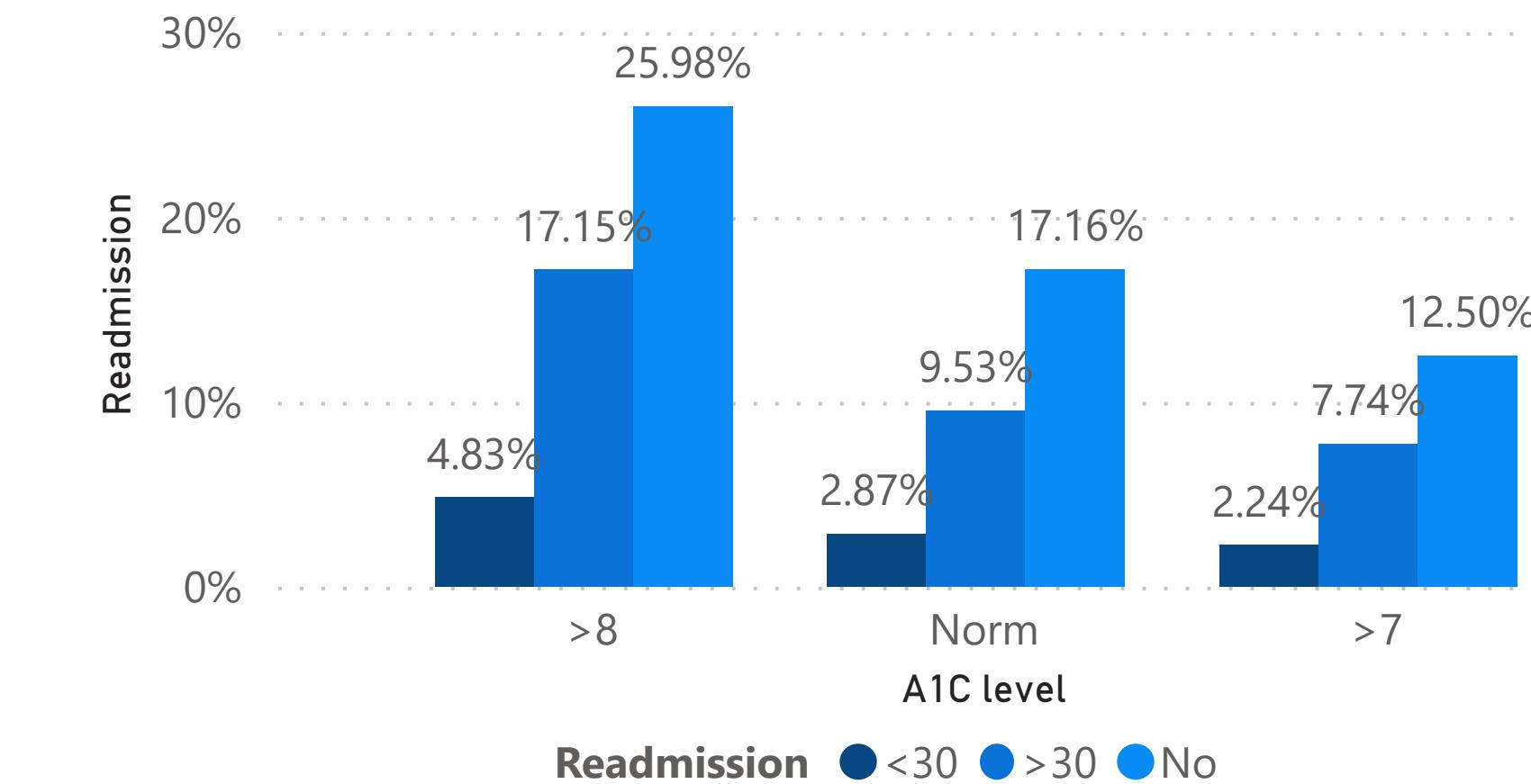
← Readmitted is more likely to be No when Glipizide Metformin is No than otherwise (on average).



Relation between Readmission and Glucose serum level



Relation between Readmission and A1C level



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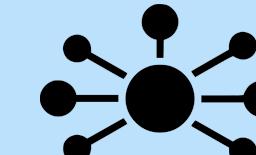
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CORRELATION ANALYSIS & INTELLIGENCE

- Lab Procedures have a direct correlation with medications, diagnosis and time in Hospital
- Medications are also observed to have a high correlation with Time spent in Hospital and non-lab procedures
- An intelligent parameter driven decision system was created to analyse the impact of key influencers on readmission rates

Correlation analysis



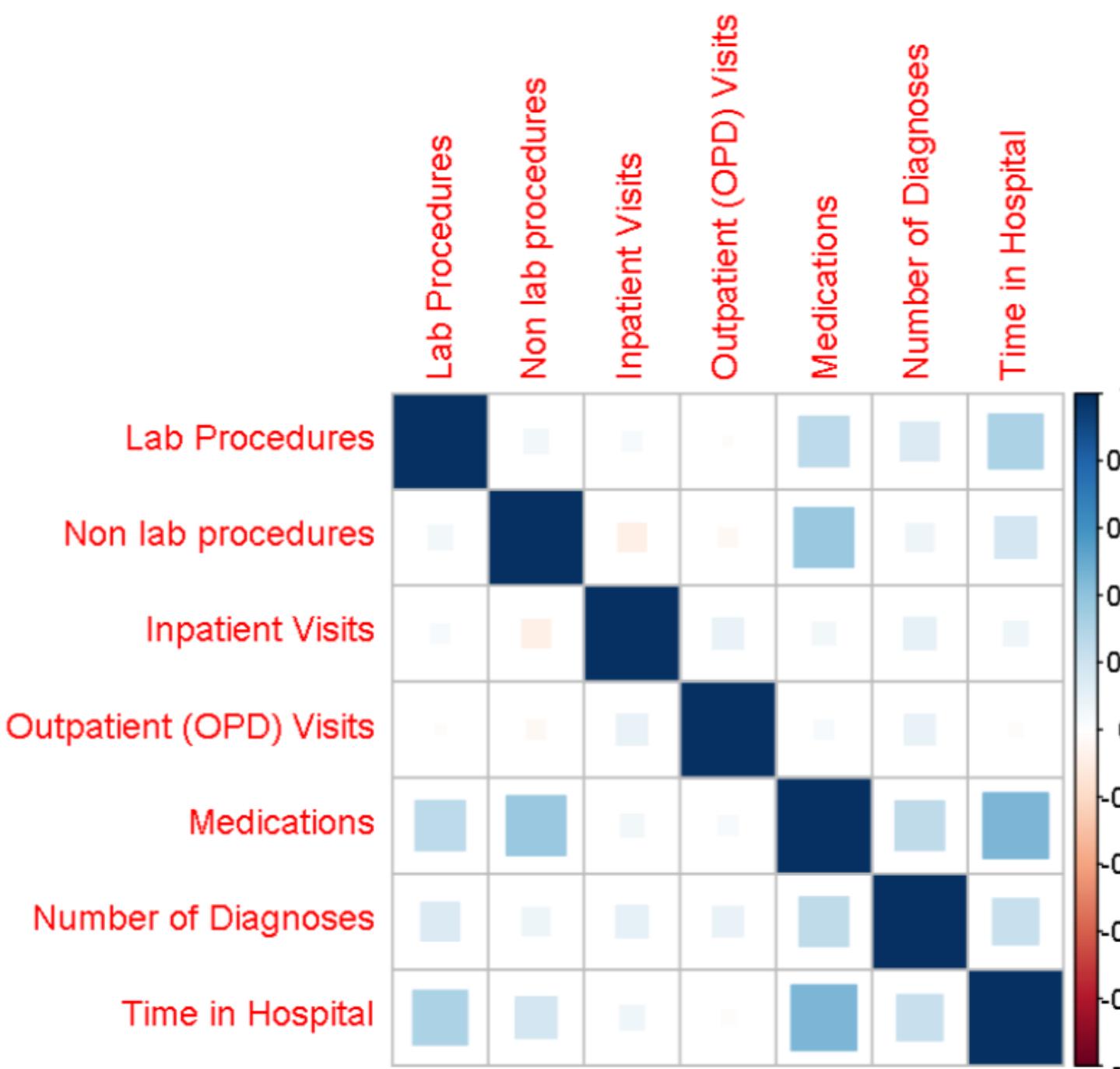
Key influencers Top segments

What influences Readmitted to be <30



When...

....the likelihood of Readmitted being <30 increases by



Inpatient Visits is more than 3

3.01x

Inpatient Visits is 1 - 3

1.80x

Number of Diagnoses is more than 7

1.39x

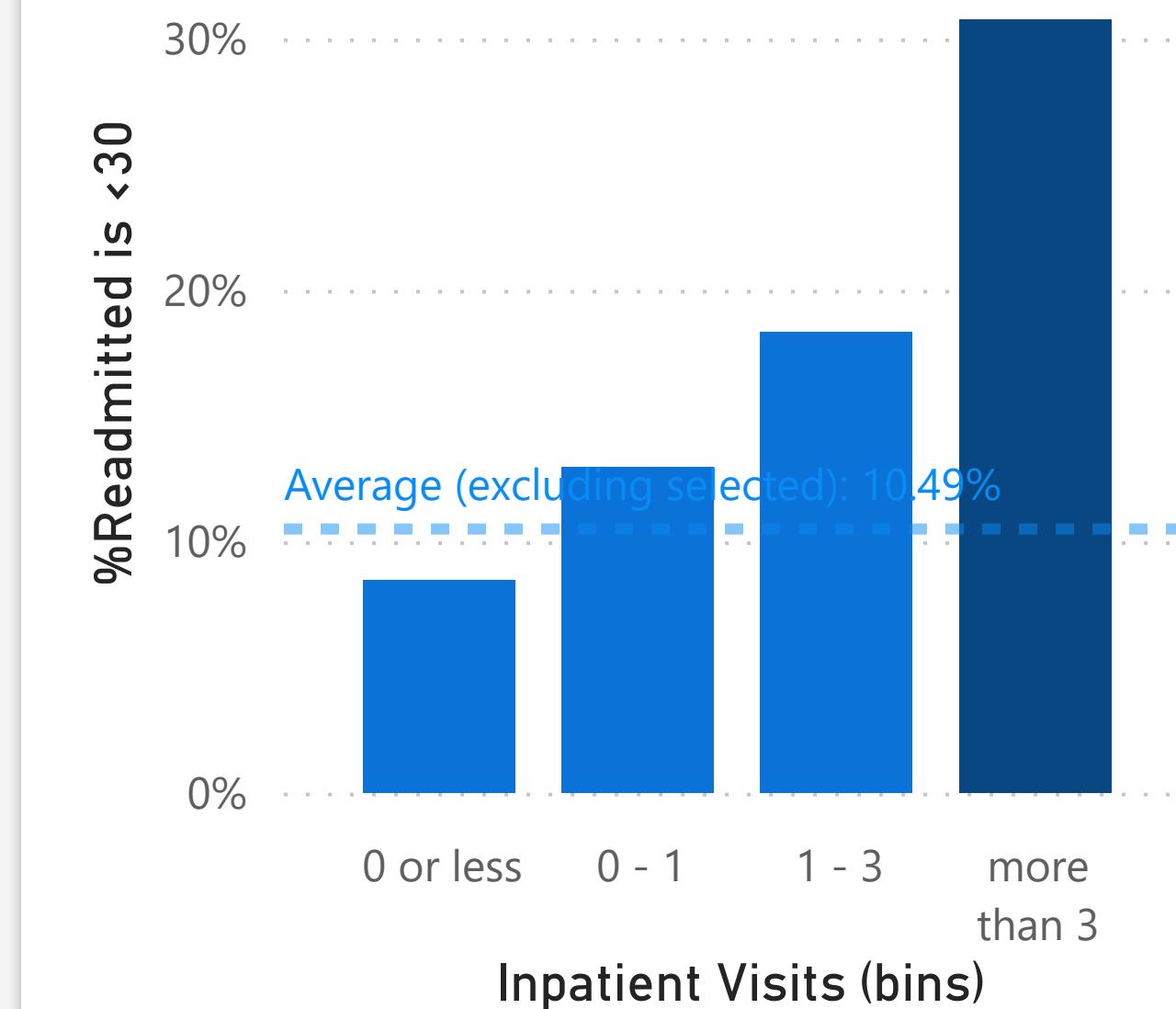
Outpatient (OPD) Visits is more than 0

1.36x

Time in Hospital is more than 3

1.31x

← Readmitted is more likely to be <30 when Inpatient Visits is more than 3 than otherwise (on average).



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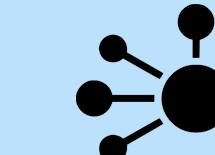
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Primary Diagnosis

All

Secondary Diagnosis

All

Additional Diagnosis

All

Patient Diagnosis

Primary Diagnosis

Digestive

Secondary Diagn...

Other

Additional Diagn...

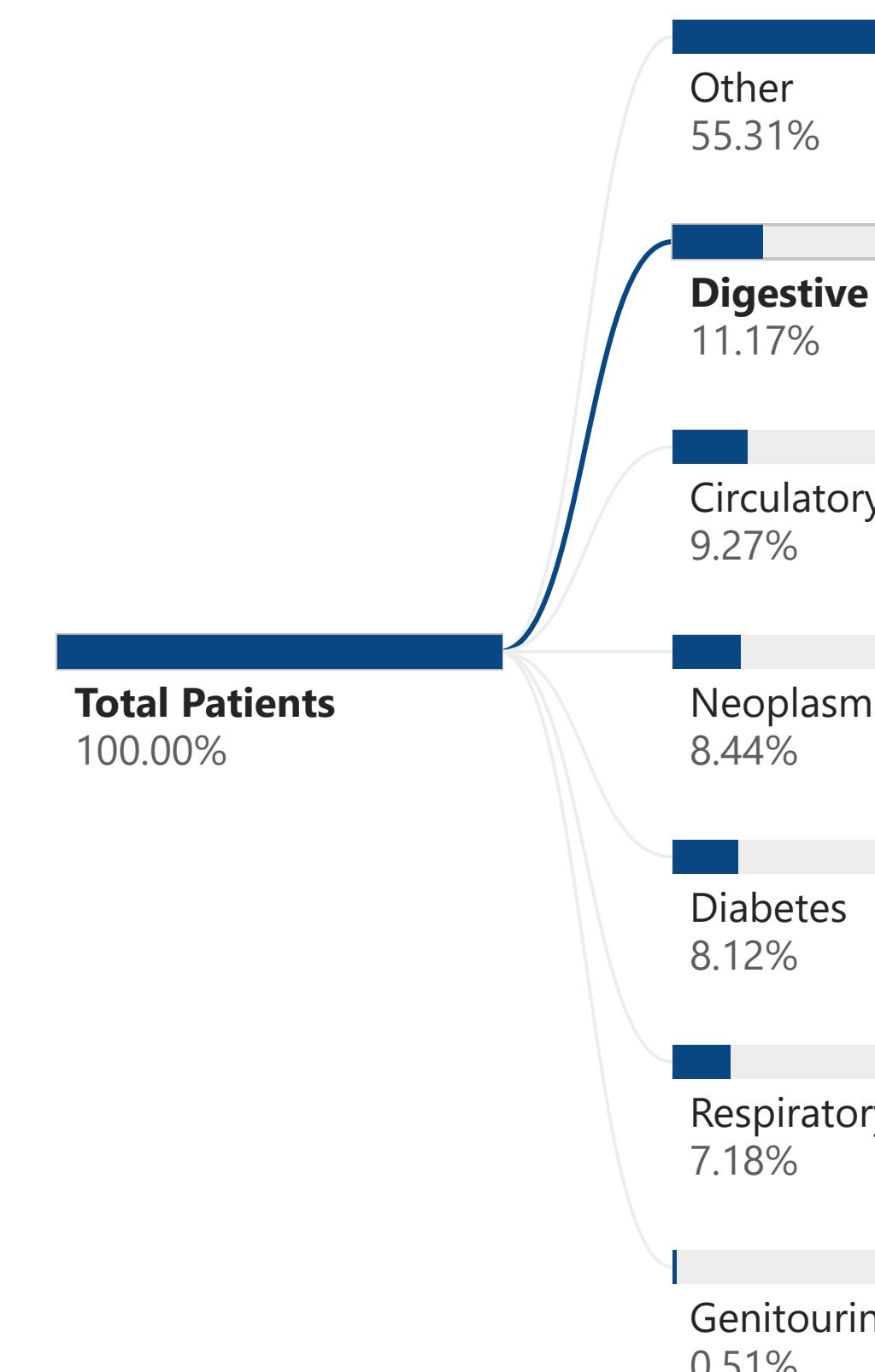
Other

Other
55.31%Digestive
11.17%Circulatory
9.27%Neoplasms
8.44%Diabetes
8.12%Respiratory
7.18%Genitourinary
0.51%Other
6.64%Diabetes
1.76%Respiratory
0.87%Neoplasms
0.87%Circulatory
0.56%Digestive
0.40%Genitourinary
0.08%Other
3.49%Diabetes
1.48%Neoplasms
0.71%Circulatory
0.38%Digestive
0.36%Respiratory
0.19%Genitourinary
0.02%

DIAGNOSTIC MODELLING & DECISION ANALYSIS

- Captured 3 levels of diagnosis and created an information based decision tree model to understand if multiple diagnostics are required to provide optimum patient analysis

- Diabetes if diagnosed in the primary or secondary diagnosis has shown that other tree levels of diagnosis such as circulatory/neoplasms/respiratory are minimized

Total Patients
100.00%

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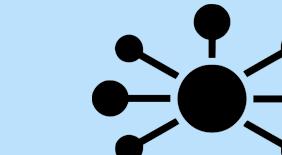
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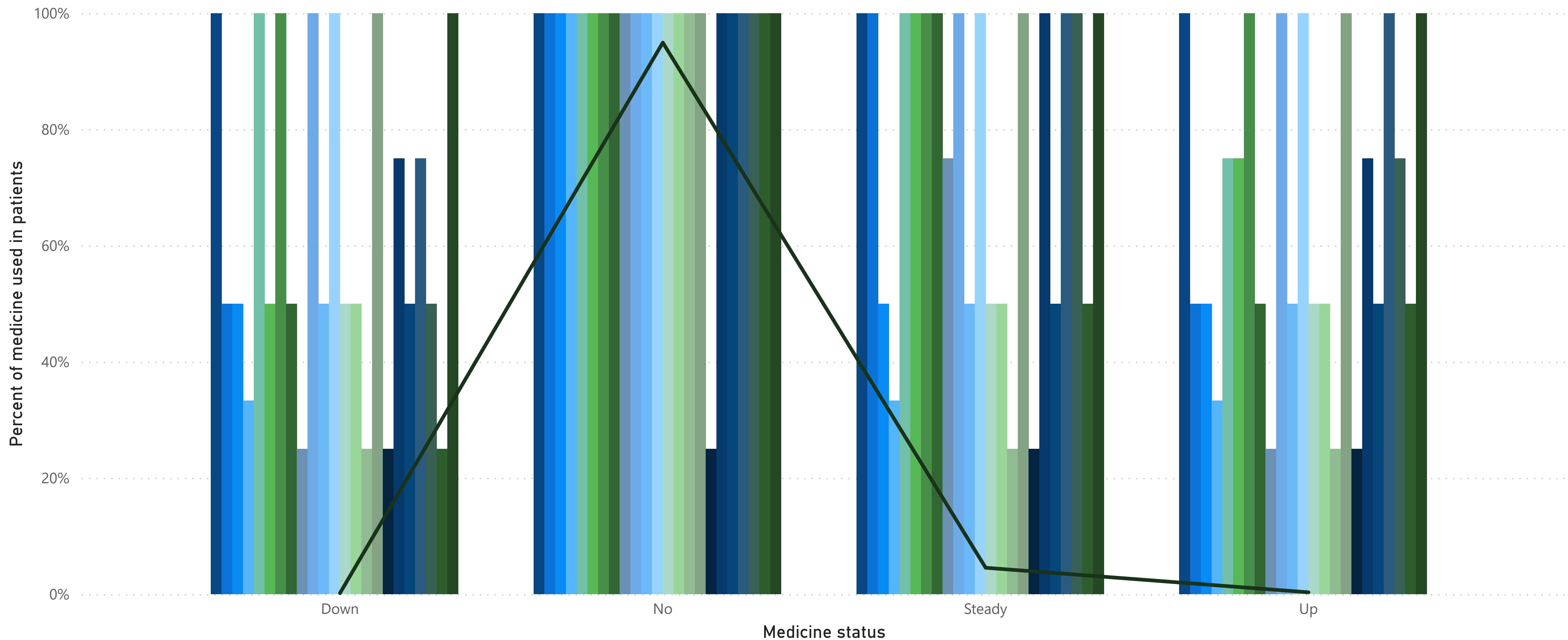
Statistical inference



IMPACT OF MEDICINE ADMINISTERING ON RE-ADMISSIONS

- We analyzed impact of over 24 medications that were administered to patients by the physician
- The analysis on impact of readmission was done at levels of dose reduction, Steady dose and increasing the dose

Medicinal usage impact in patients



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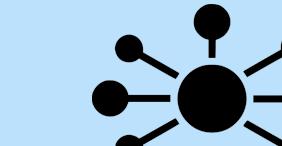
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STATISTICAL ANALYSIS OF ATTRIBUTES & ROC CURVE

- Attributes Significance analysis was done to identify the key attributes impacting re admissions and at the same time identifying attributes with minimal impact
- ROC curve shows 60% accuracy at 0.5 cutoff levels. This was done to identify which customers are highly likely to get admitted

