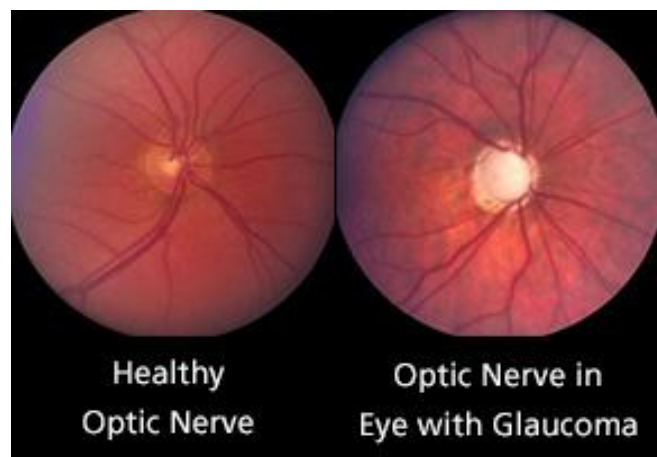


## Goal

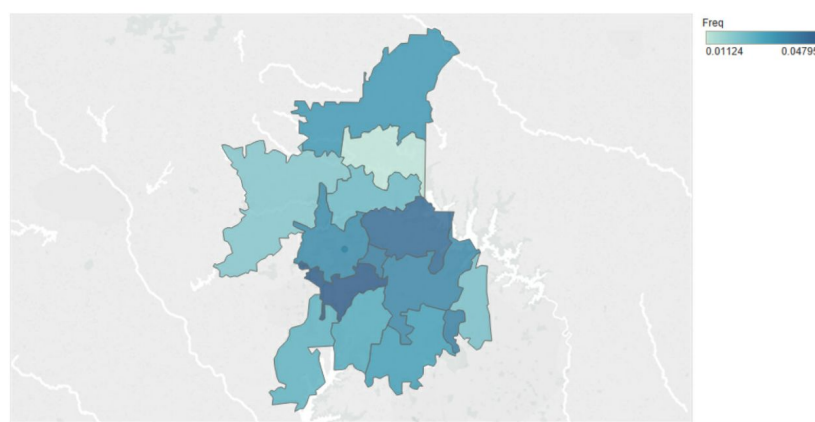
Predict and identify risk factors for glaucoma patients presenting to Duke legally blind.



Glaucoma, the leading cause of irreversible blindness in the world, is a disease of the optic nerve that is difficult to diagnose using any one clinical measurement.

## The Data

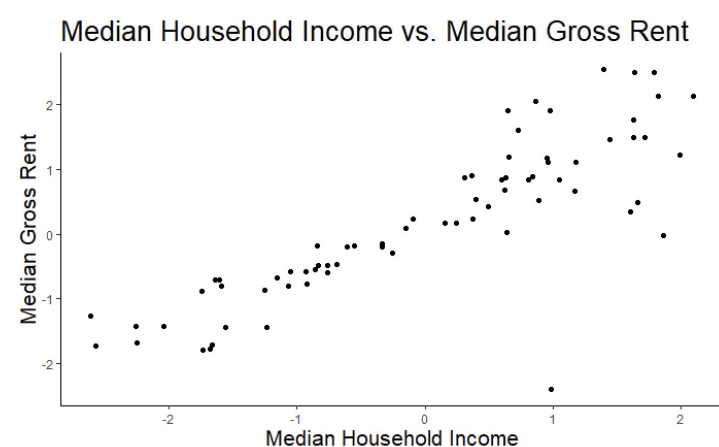
We used a combination of EHR data between 1993-2019 to assemble a clinical data set. Patients who lived in Durham zip codes also had demographic data pulled from Durham Neighborhood Compass. There were **33862** total glaucoma patients, of which approximately **3% (988)** presented blind.



Proportion of Blindness in Durham Zip Codes

## Multicollinearity

Many of the variables were highly correlated, leading to inflated standard errors and limiting the results of our model.



# Predicting Blindness

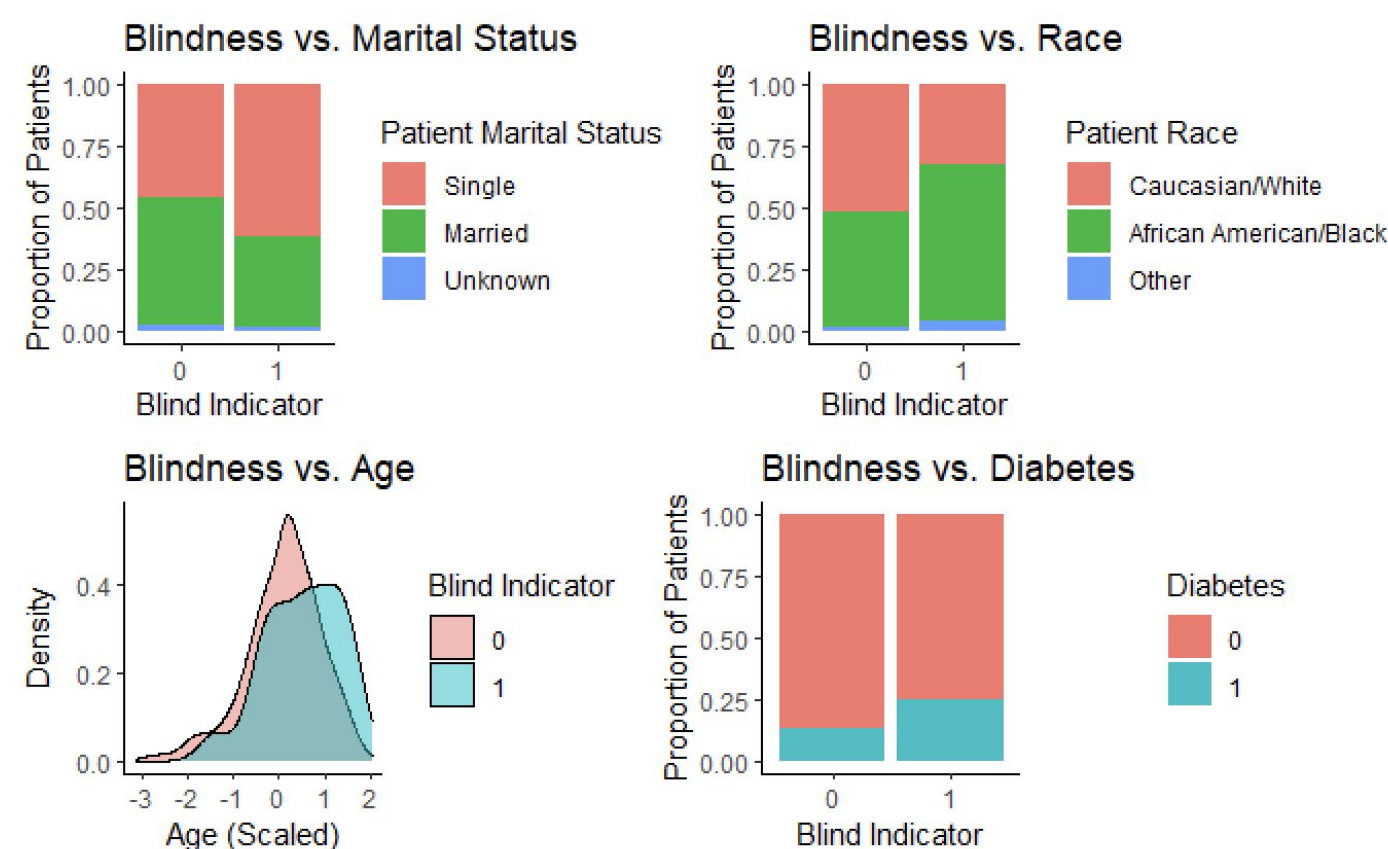
In Duke's Glaucoma Patient Population

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## EDA



In general, the blind cohort had a greater proportion of single patients, African Americans, men, older patients, diabetes, and patients with a history of macular degeneration.

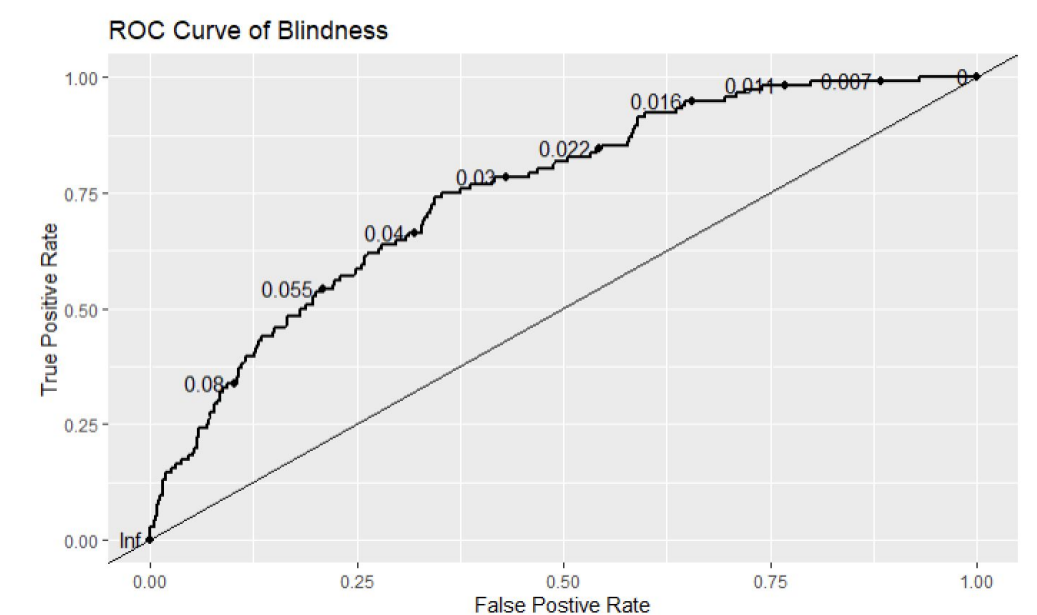
## Model Selection

- LASSO and ridge regression models to attempt to account for multicollinearity
  - Eliminated all variables
- Univariate models for all variables → Multivariate model containing significant predictors
  - Vfmeandev and rnlflmean\_g not included
  - One model using all possible predictors
  - One model using only demographic variables for patient use

## Results

Terms	OR_uni	P_value_uni	AUC	OR_multi	P_value_multi
Patient Race (African American/Black)	2.310	0.000	--	2.862	0.000
Patient Race (Other)	1.191	0.147	--	3.969	0.017
Patient Marital Status (Married)	0.611	0.000	--	0.527	0.004
Patient Marital Status (Unknown)	0.788	0.001	--	1.444	0.566
Age (Years)	1.229	0.000	0.557	2.226	0.000
Corneal Thickness (Right Eye)	0.000	0.000	0.571	1.176	0.367
Corneal Thickness (Left Eye)	0.768	0.000	0.567	0.663	0.288
Macular Degeneration	2.047	0.000	--	1.501	0.121
Median Age	0.844	0.010	0.538	0.460	0.186
Retirement Age Population	0.878	0.035	0.538	2.135	0.144
Median Gross Rent	0.870	0.028	0.542	1.665	0.231

The final model was fit on 3,066 complete observations. Displayed above is a selection of the most significant variables in the final model, notably including race, marital status, and age.



This model's ROC curve is shown above. The AUC is 0.750.

## Future Work

We are looking into timing to blindness under Duke care using survival analysis.

