All models are wrong, but some are useful...

An attempt to predict high cholesterol via multiple linear regressions

All models are wrong, but some are useful... maybe not this one

An attempt to predict high cholesterol via multiple linear regressions

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- ➡ Problem
- Investigation
- Results
- Next Steps

The problem: People hate needles

Context

Cholesterol is a waxy substance found in our blood. High LDL cholesterol increases your **risk of heart disease, heart attacks, & stroke**. High cholesterol has **no symptoms**, and has been called a **silent killer**

Problem statement

Can we **predict high LDL ("bad") Cholesterol** based on **self-measurable metrics** that don't involve needles or require visiting a doctor's office?

A topic that hits close to home...

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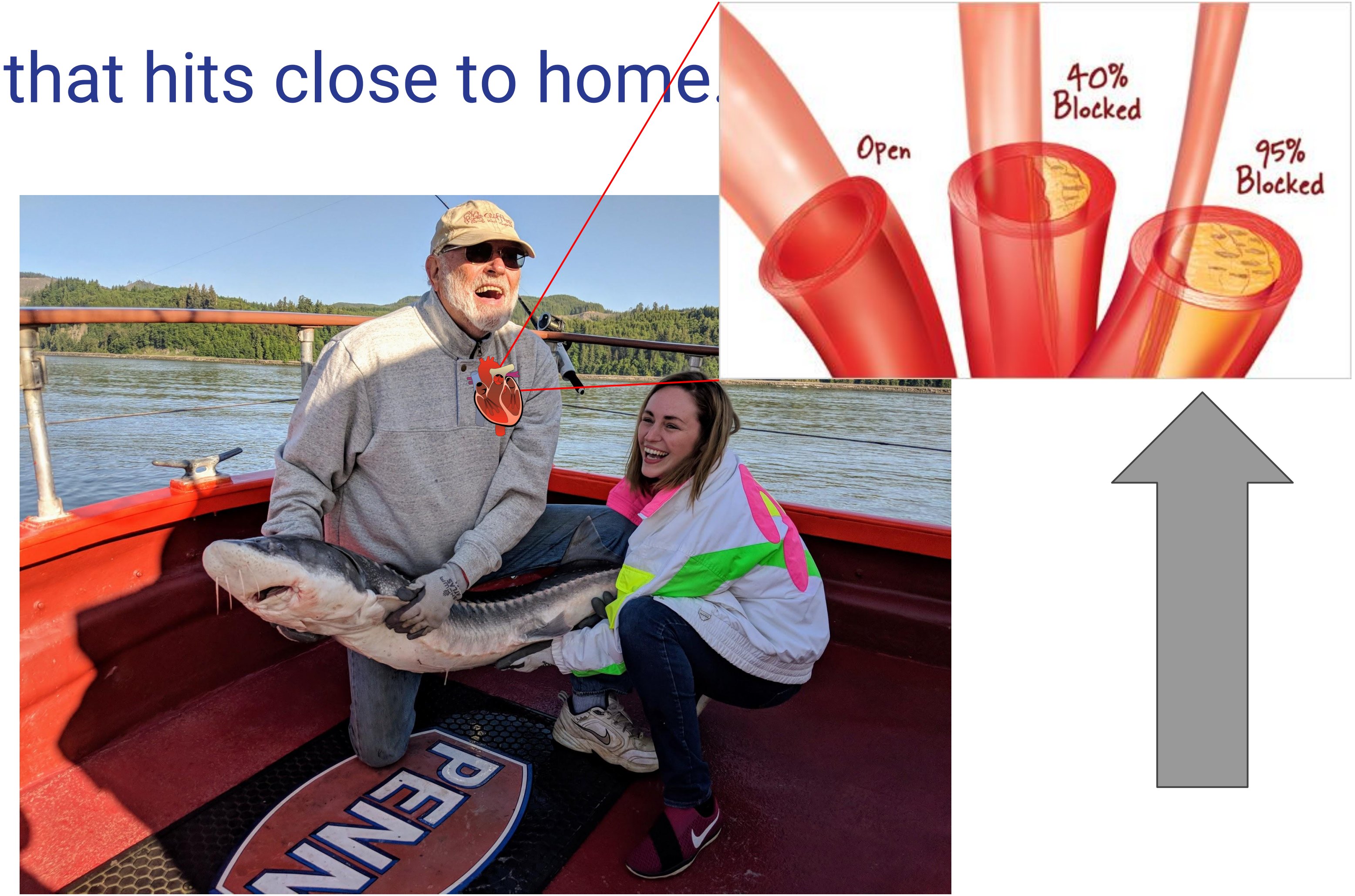

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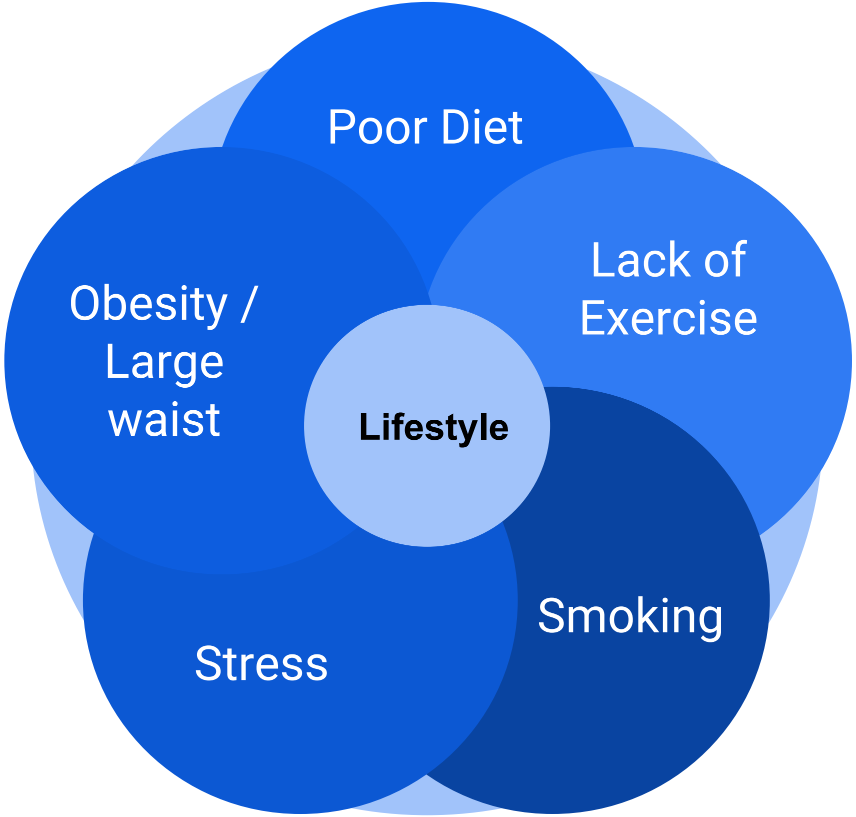
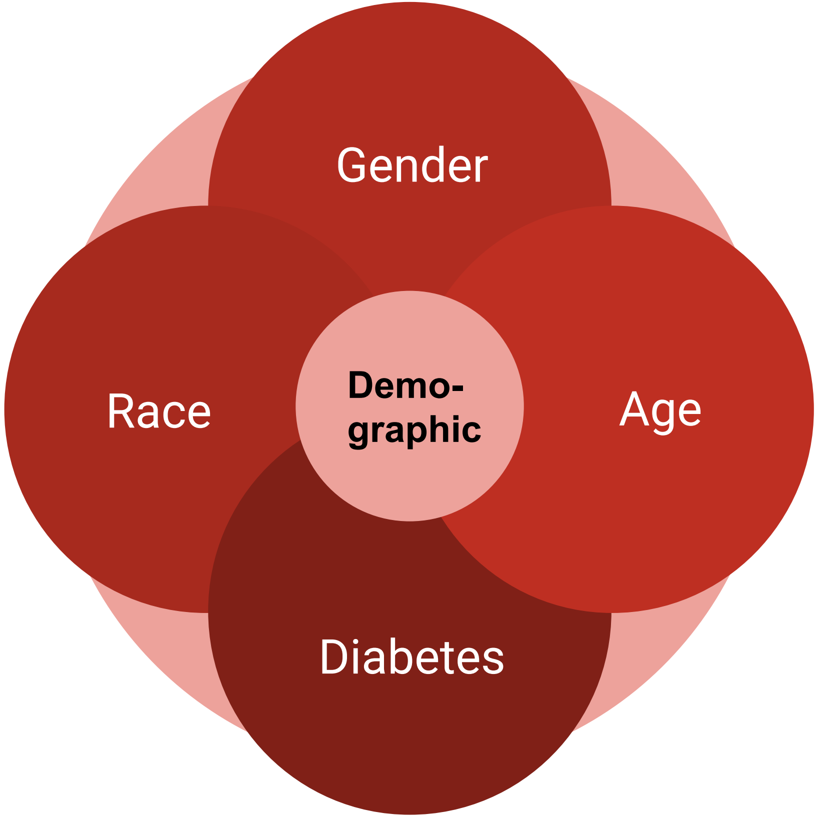
Risk Factors include...





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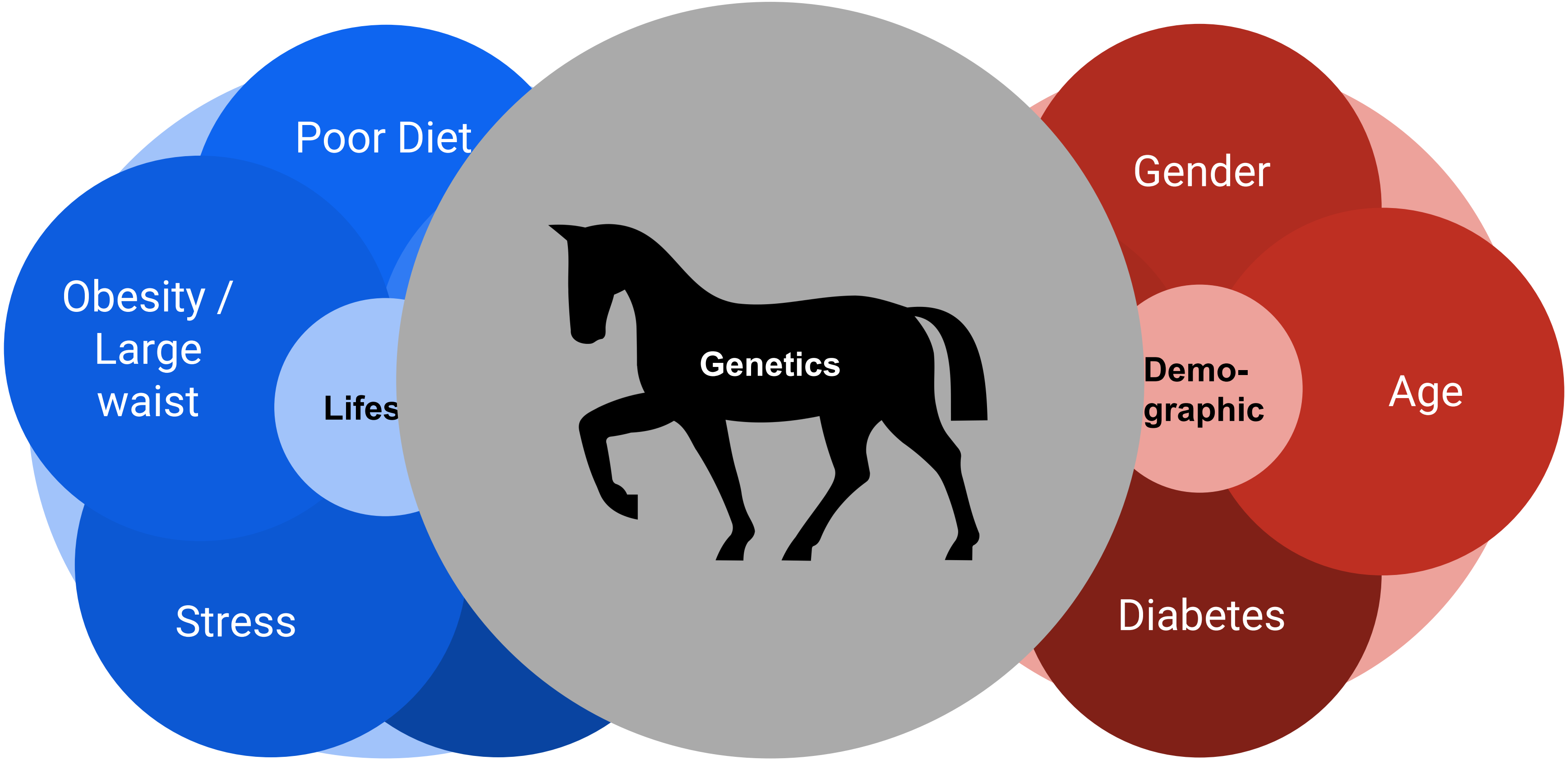
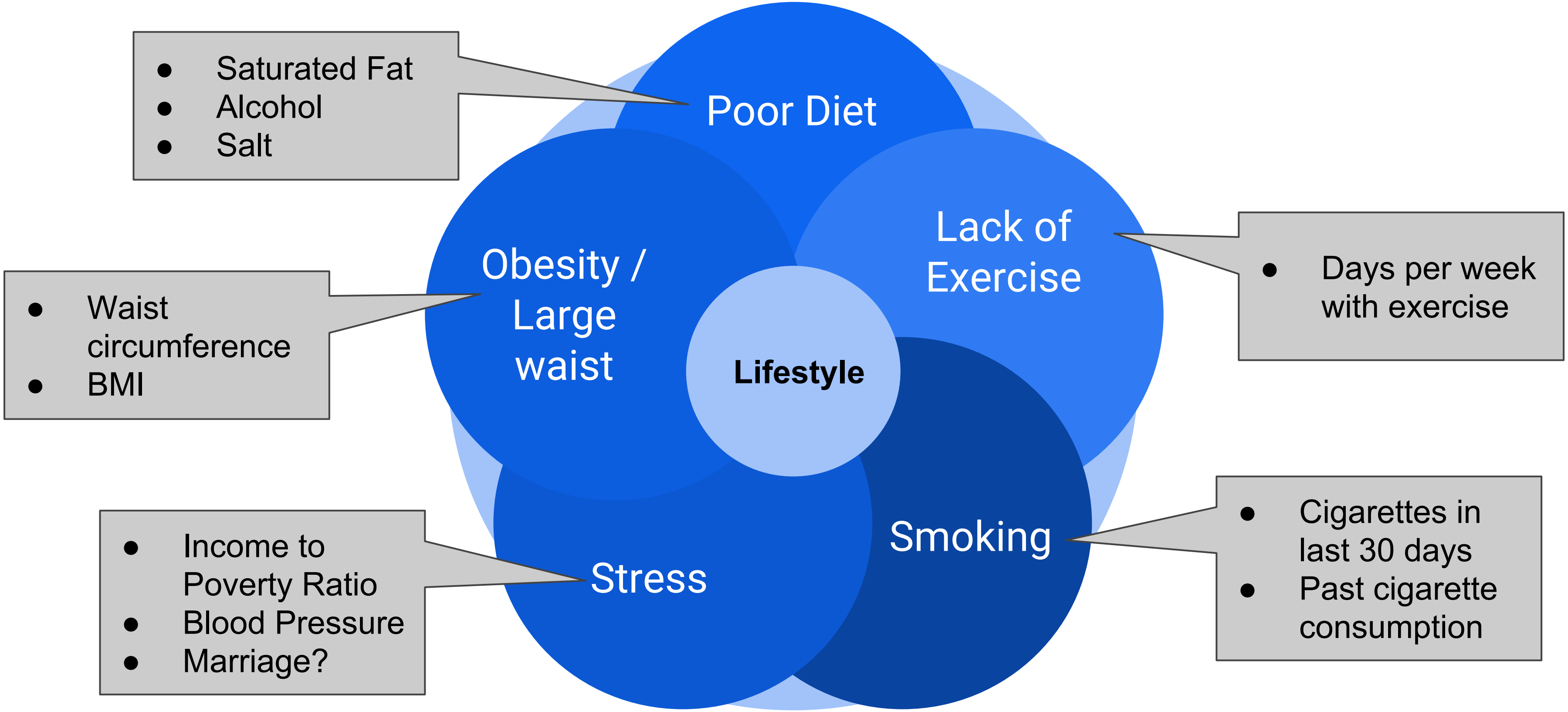


National Health & Nutrition Examination Survey



Lifestyle

Poor Diet

- Saturated Fat
- Alcohol
- Salt

Obesity / Large waist

- Waist circumference
- BMI

Lack of Exercise

- Days per week with exercise

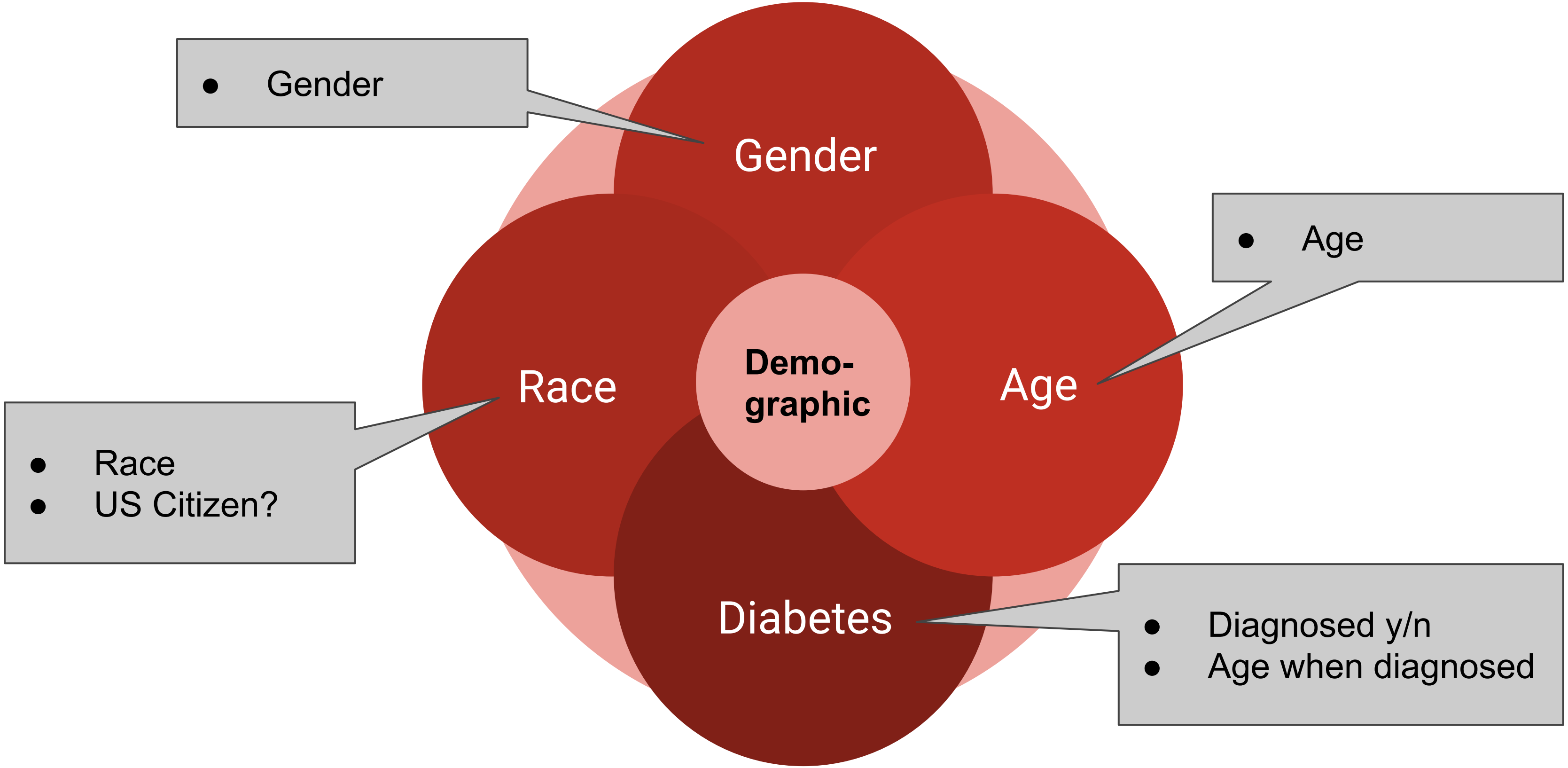
Stress

- Income to Poverty Ratio
- Blood Pressure
- Marriage?

Smoking

- Cigarettes in last 30 days
- Past cigarette consumption

National Health & Nutrition Examination Survey



- Gender

Gender

Race

Demo-
graphic

Age

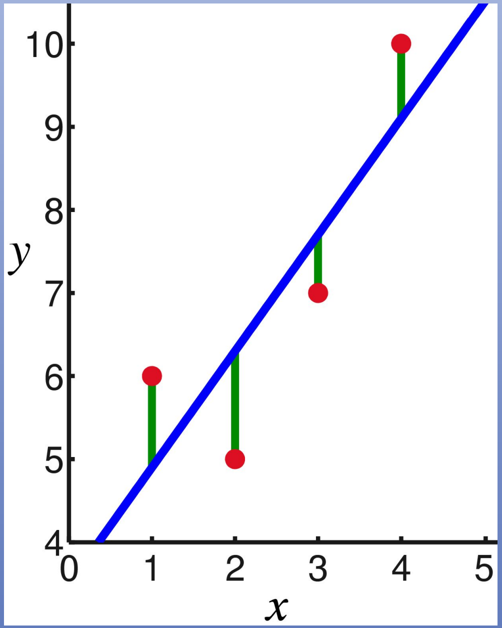
- Age

- Race
- US Citizen?

Diabetes

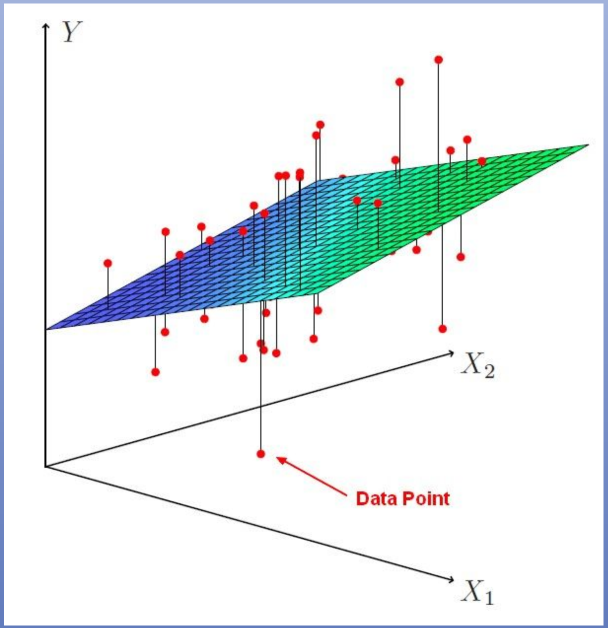
- Diagnosed y/n
- Age when diagnosed

Linear Regression: Ridge Regression

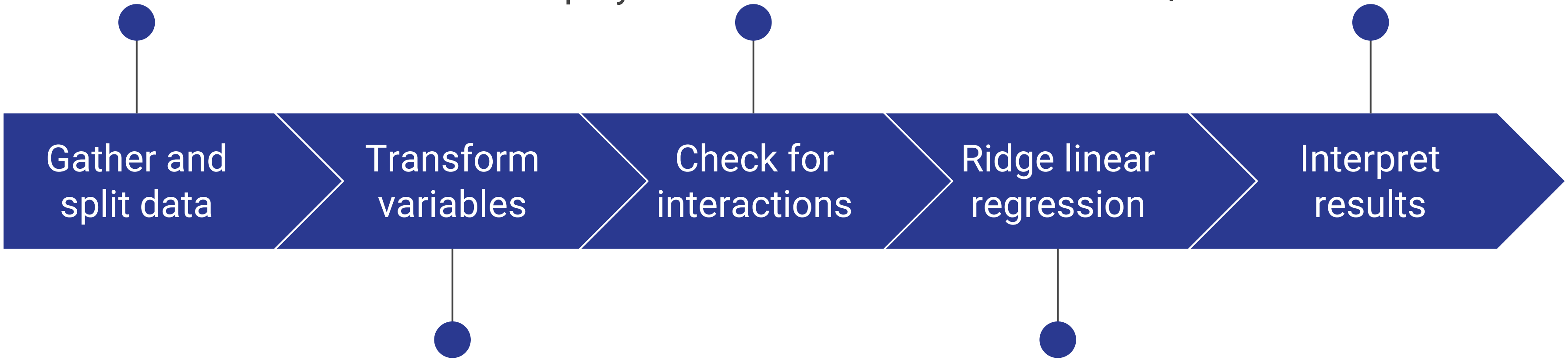


Goal:

Minimize errors (SSE) and maximize predictive power



Process



2431 Participants
17 Predictor variables
Split into “train” and “test”

Gather and split data

Transform variables

Several variables were non-normal, so these needed transforming[1]

MSE tests showed there was no need to generate higher order polynomials

Check for interactions

Ridge linear regression

“Train” the model with regression technique that reduces both in and out of sample errors

“Test” how the model performs

Interpret results

[1] Used BoxCox transformation

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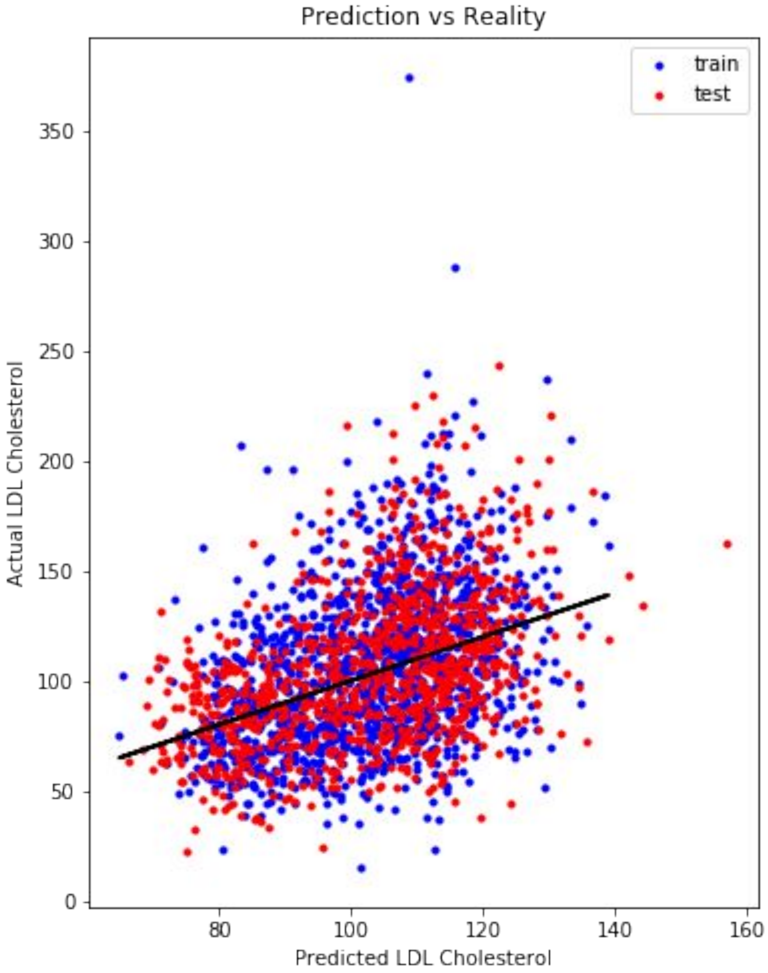


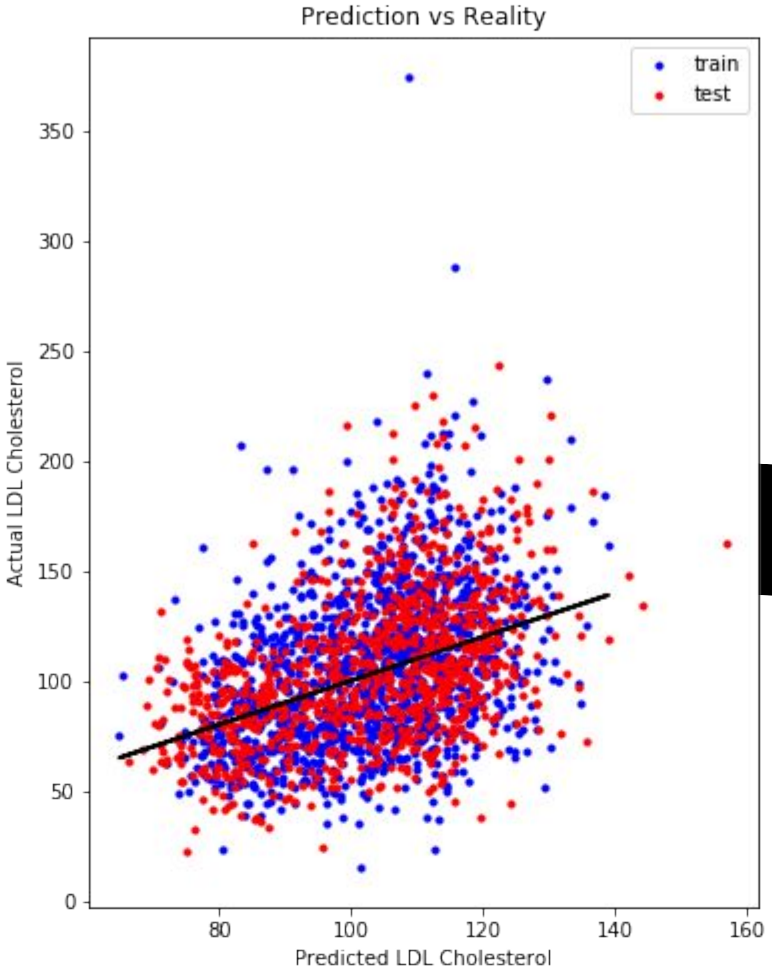
Test R^2: 0.108

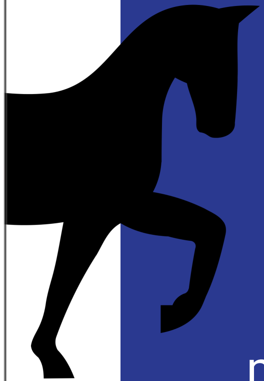
Difference from train R^2: 0.038

Test SSE: 3.04

Difference from train SSE 1.36

In other words, we expect our model could account for ~11% of variability seen in LDL Cholesterol





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Next Steps

Plenty of room for improvement, but linear regression may not be the right tool for the job

Ways we could improve linear regression:

- More Data - multiple years
- Smarter feature generation from lifestyle survey (e.g. exercise)
- Transformations of data with 0’s (e.g. smoking, alcohol)