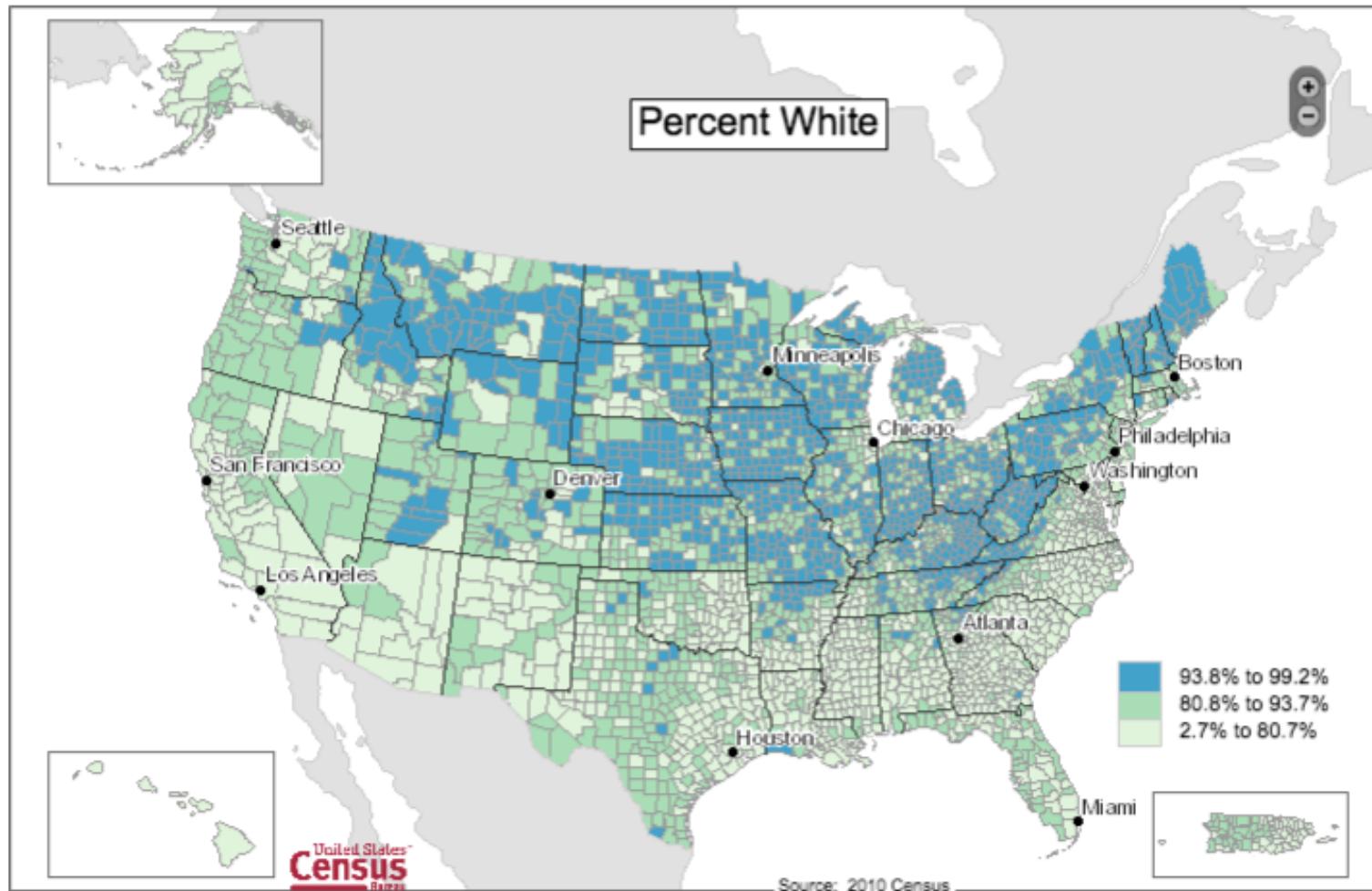


# What do we do with sports data?

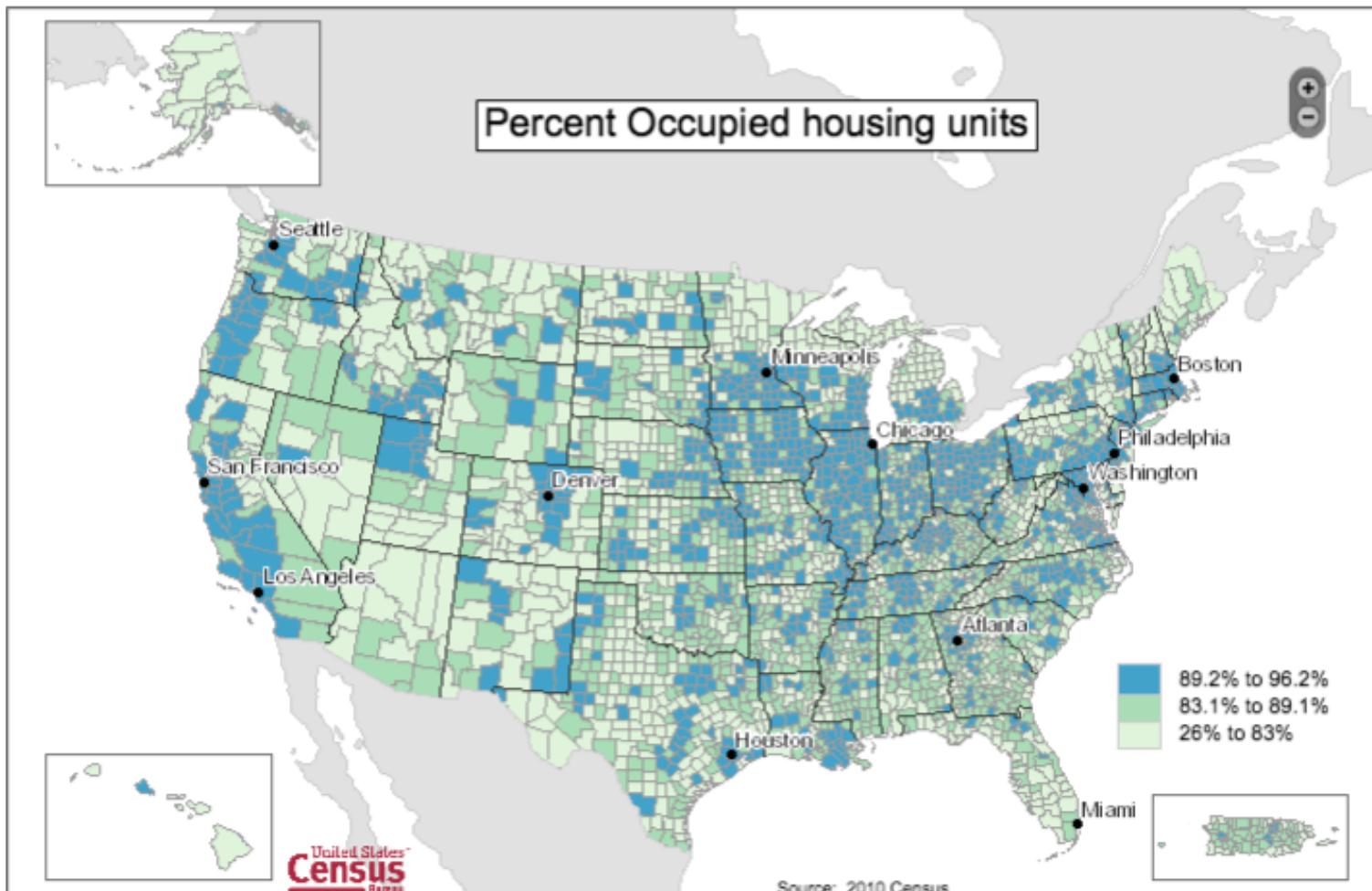
Plus a little review...

# Government data

How are people distributed?

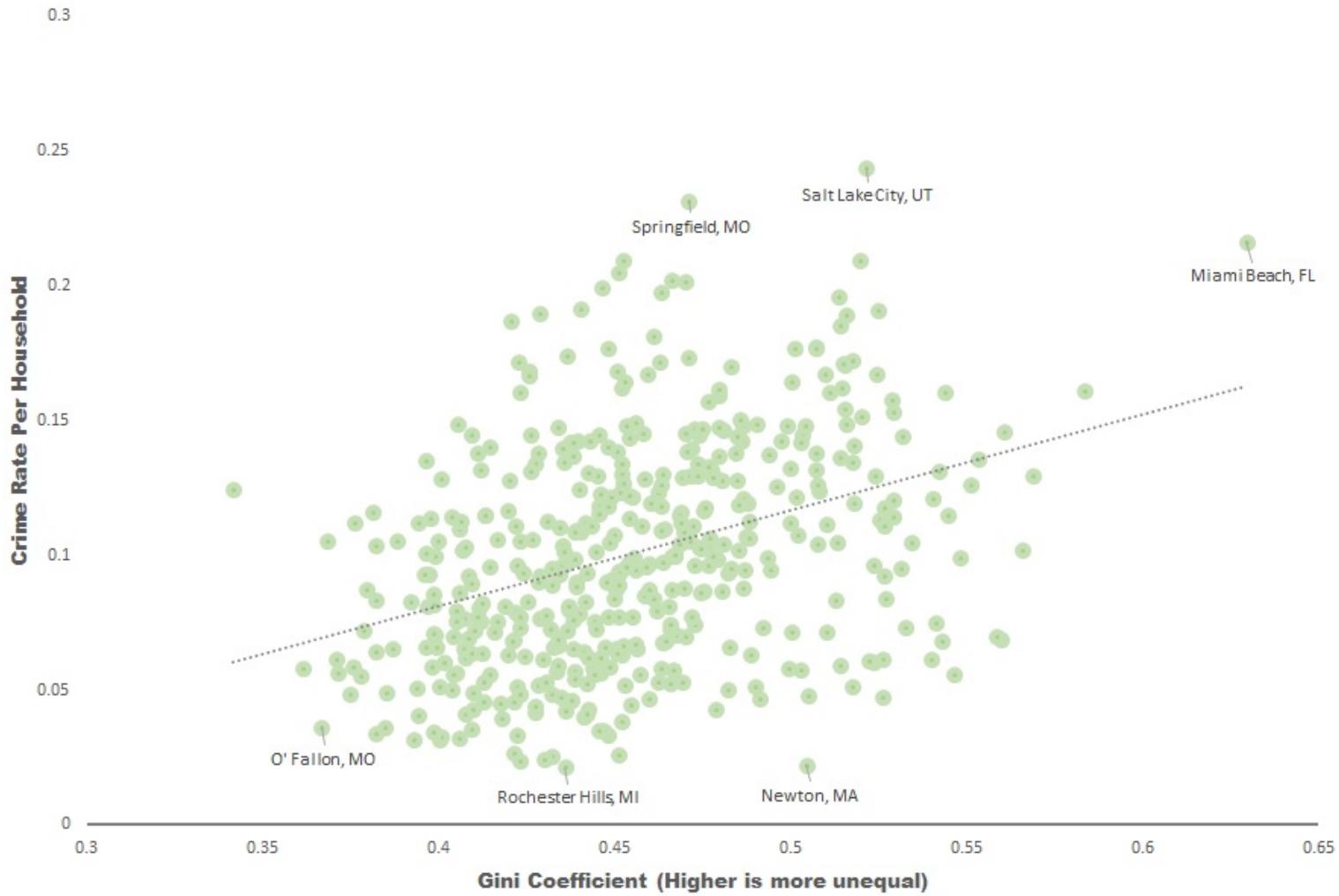


How is income distributed?



How is poverty related to crime,  
health, housing, etc?

## INCOME INEQUALITY VS CRIME RATE BY CITY

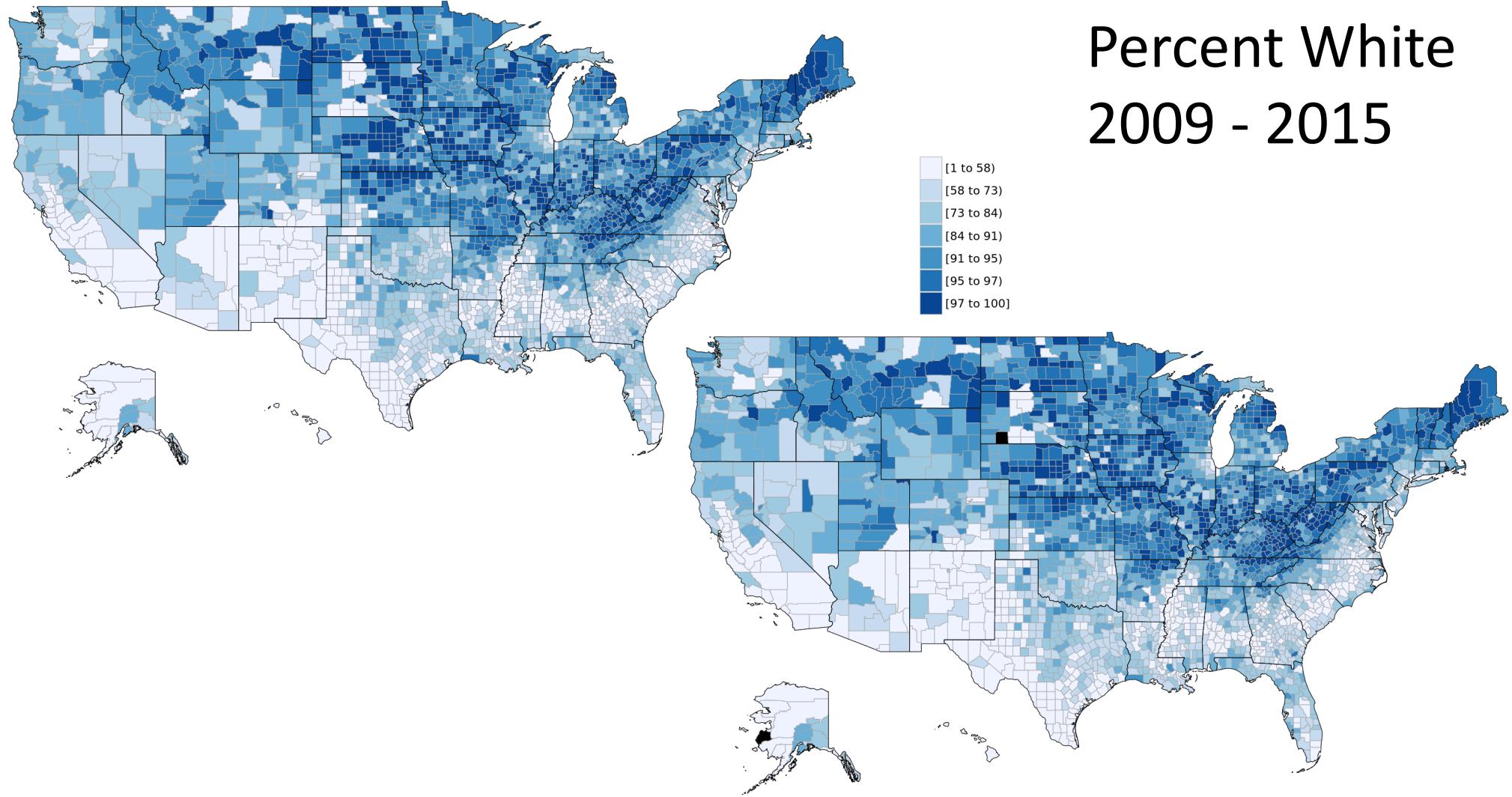


What factors are related to  
change in poverty?

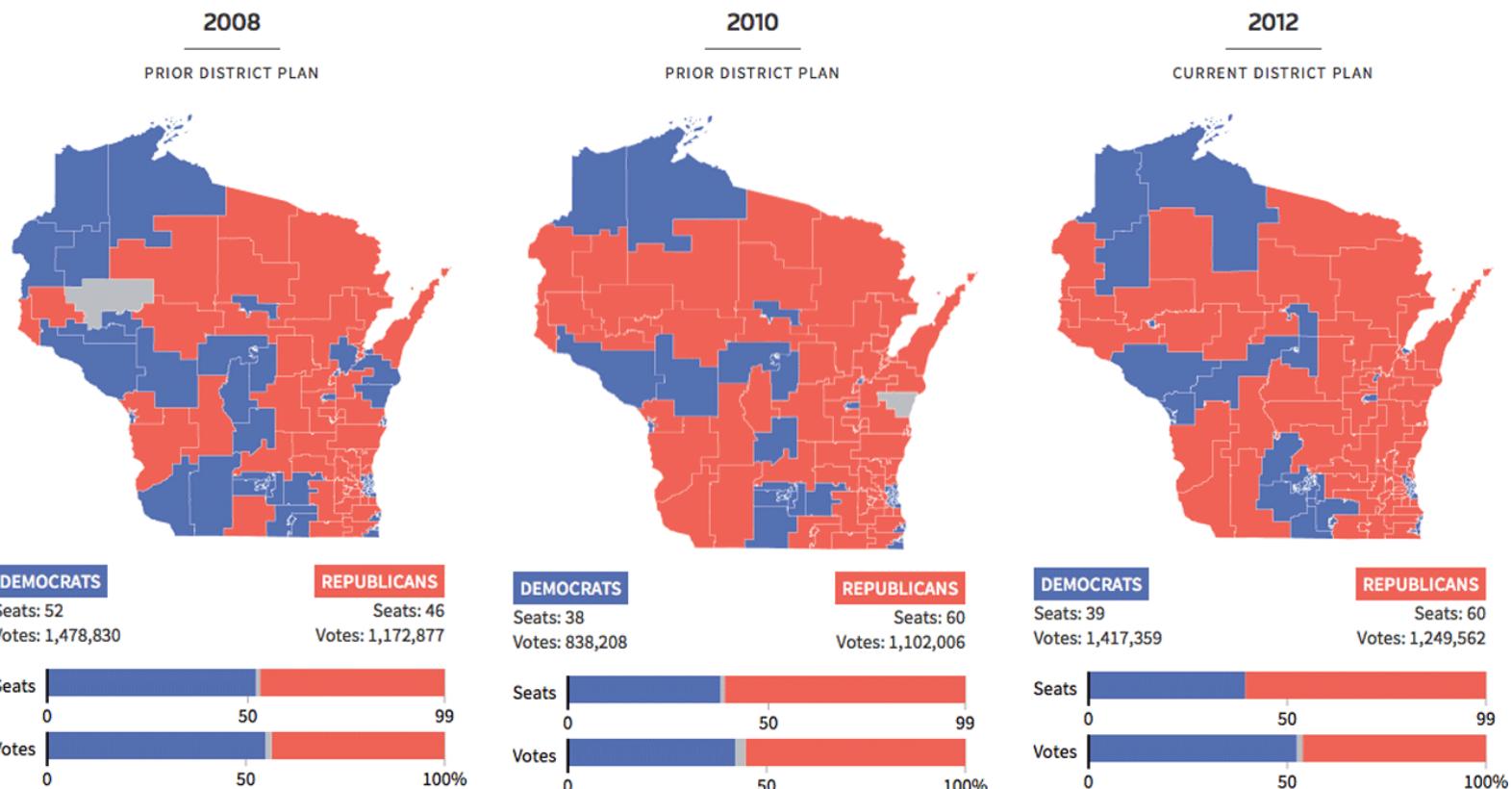
What factors correlate with child welfare?

How is racial composition  
changing?

# Percent White 2009 - 2015



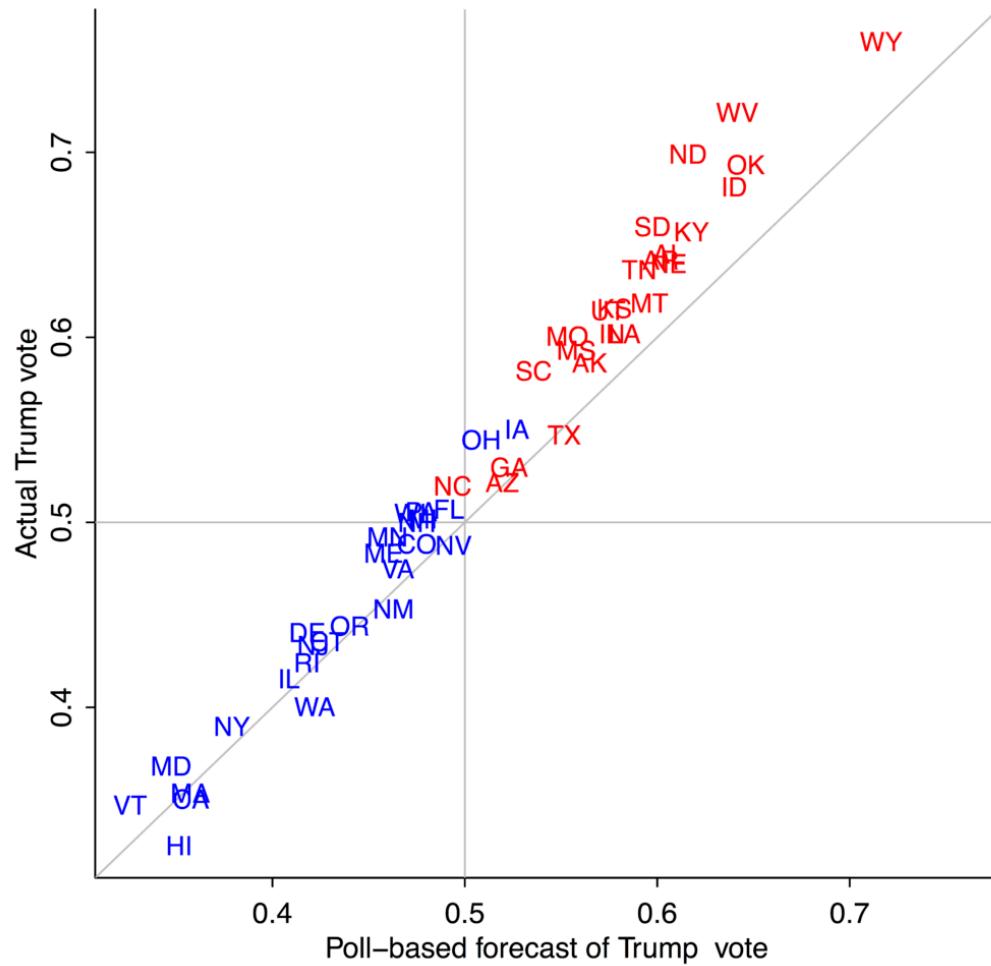
How do we represent people  
given their race, income, and  
political leaning?



# Politics

Do polls predict political  
outcome?

**Nationally, Trump got 2% more of the vote than predicted**



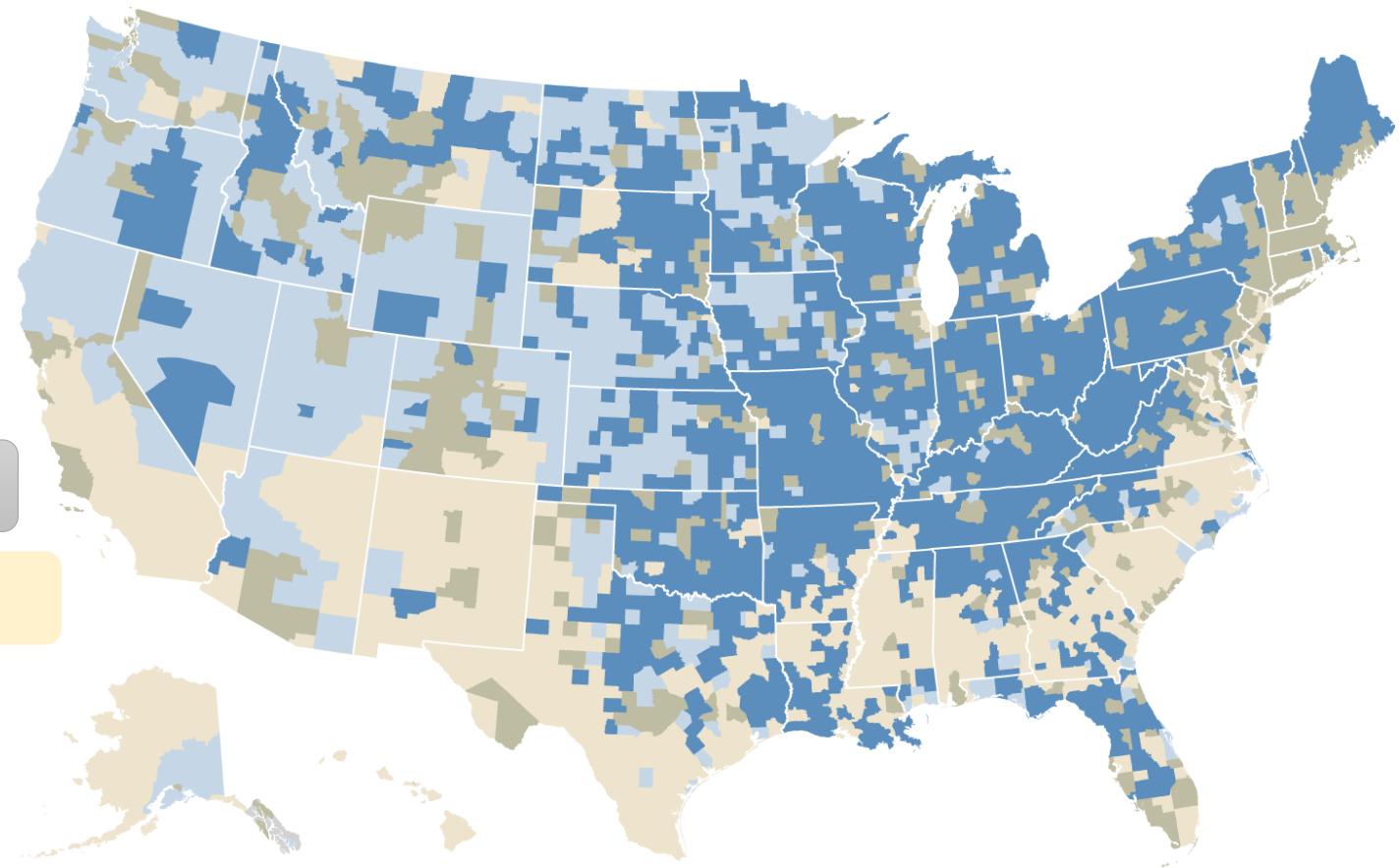
Why are polls wrong in red  
states?

**White, no college**

**White, some college**

**White, college degree**

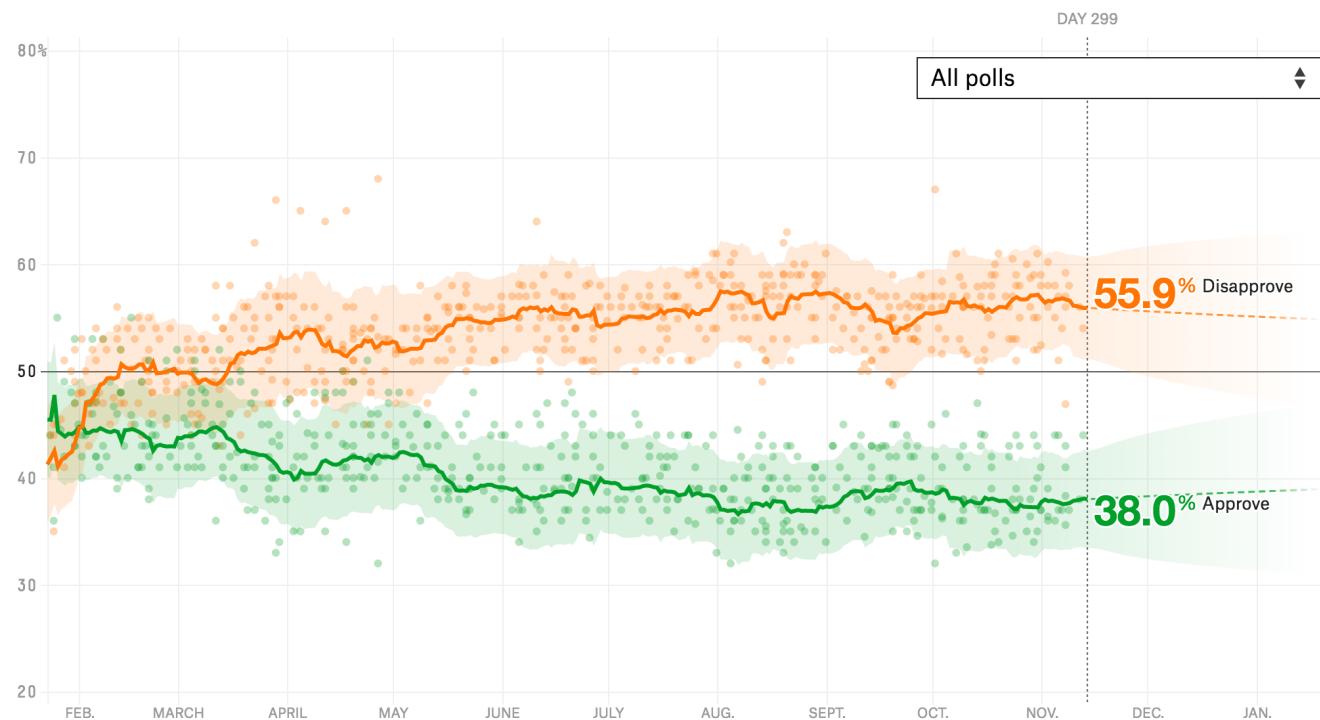
**Non-white**



When is there error?

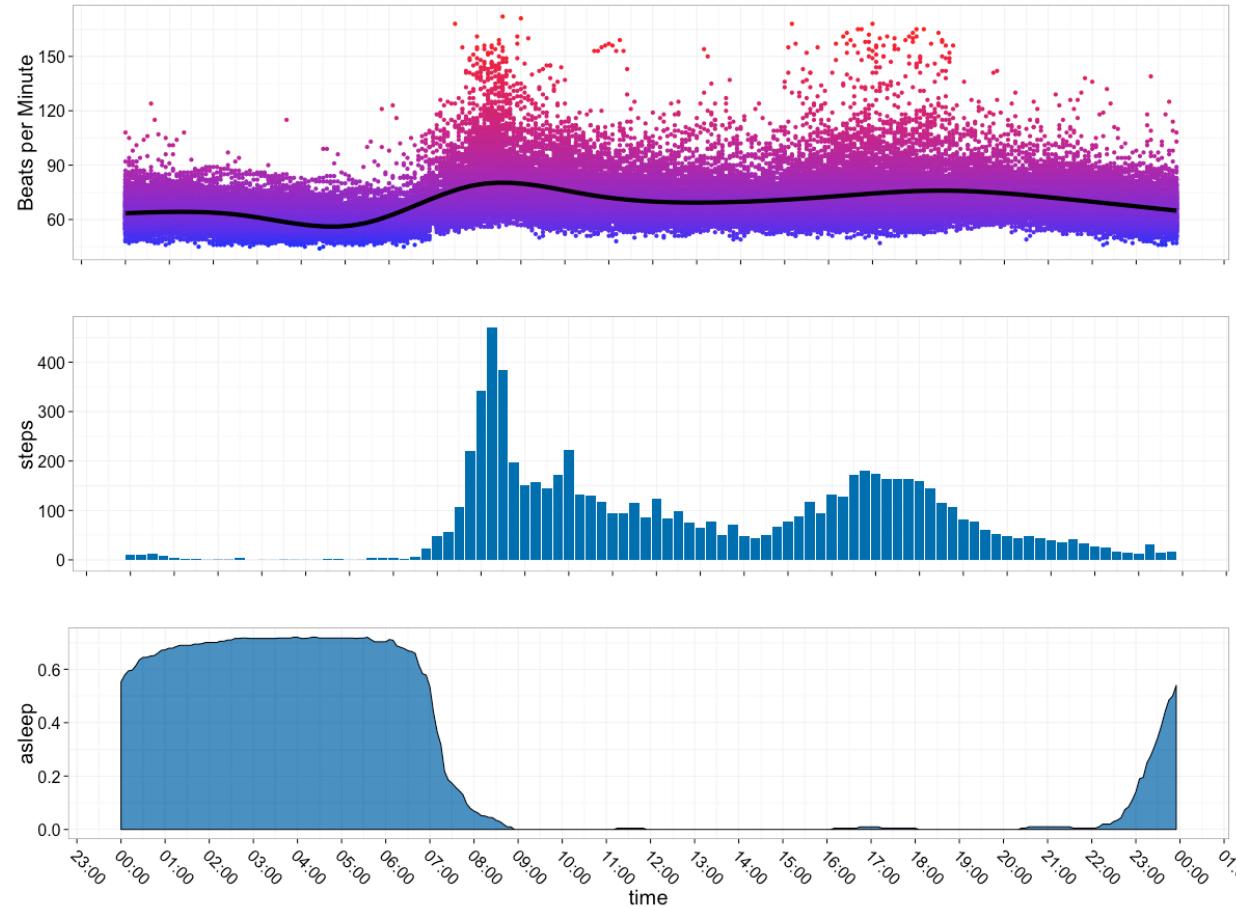
# How unpopular is Donald Trump?

An updating calculation of the president's approval rating, accounting for each poll's quality, recency, sample size and partisan lean. [How this works »](#)



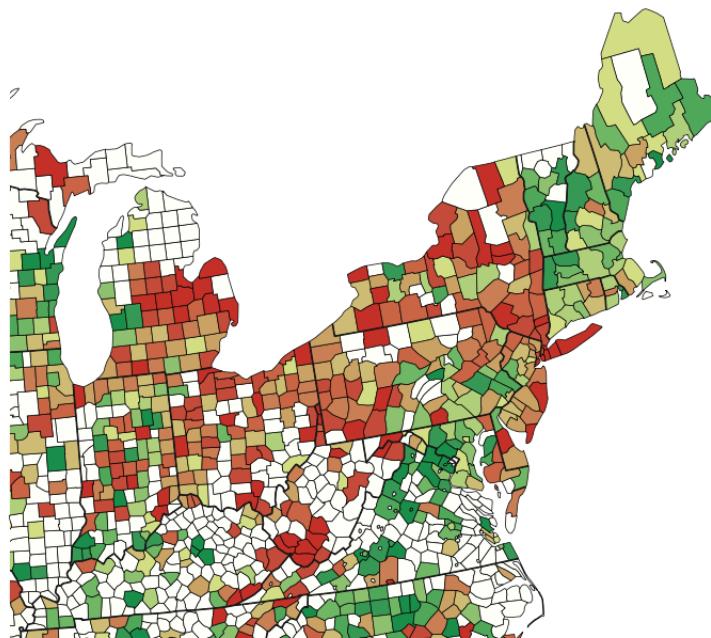
# Health

# Fitbit – Heart Rate

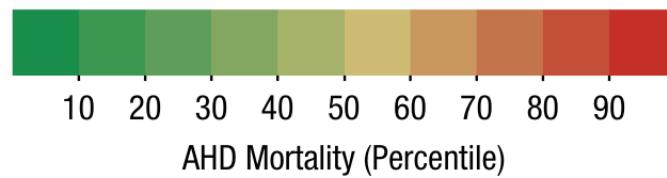
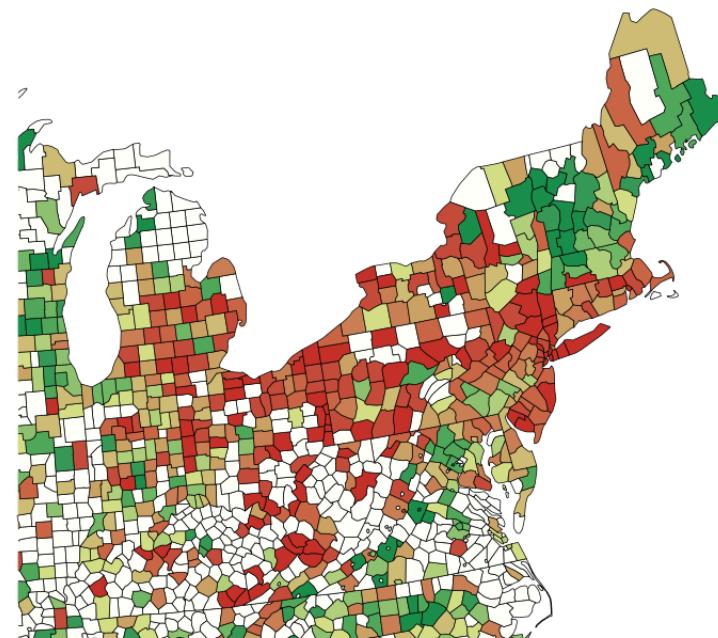


# Heart Disease Rate (based on twitter)

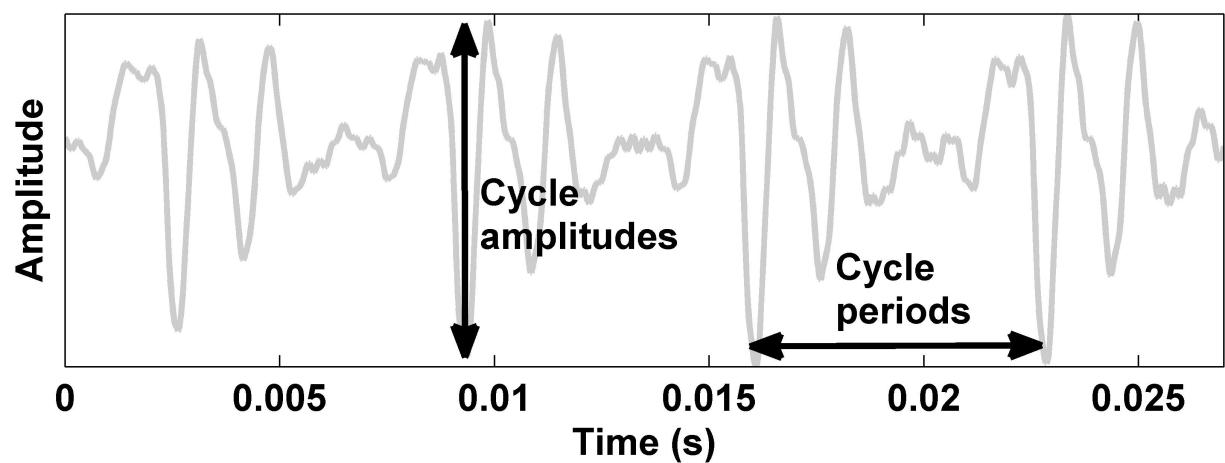
CDC-Reported AHD Mortality



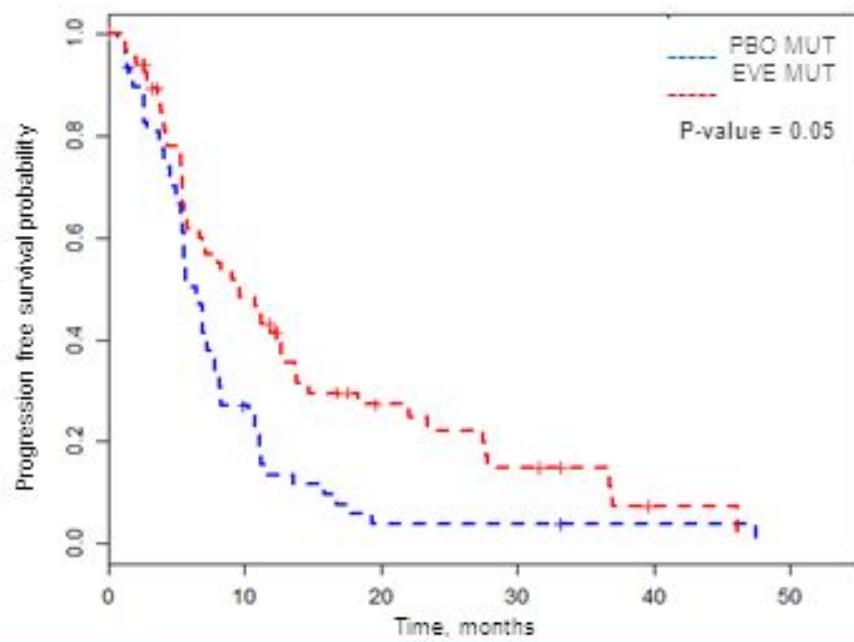
Twitter-Predicted AHD Mortality



# Diagnosis by quantifying images / sound



Pooled analysis: KM curve by treatment in the PIK3CA MUT group



## BREAST CANCER IN WOMEN: KNOW THE SUBTYPE

It's important for guiding treatment and predicting survival.



### KNOW THE SCIENCE

HR = Hormone receptor

HR+ means tumor cells have receptors for the hormones estrogen or progesterone, which can promote the growth of HR+ tumors. Hormone therapies like tamoxifen can be used to treat HR+ tumors.

HER2 = Human epidermal growth factor receptor

HER2+ means tumor cells overexpress (make high levels of) a protein, called HER2/neu, which has been shown to be associated with certain aggressive types of breast cancer. Trastuzumab and some other therapies can target cells that overexpress HER2.

**HR+/HER2-** ..... ➤ aka "Luminal A"

**73% of all breast cancer cases**

- Best prognosis
- Most common subtype for every race, age, and poverty level



**HR-/HER2-** ..... ➤ aka "Triple Negative"

**13% of all breast cancer cases**

- Worst prognosis
- Non-Hispanic blacks have highest rate of this subtype at every age and poverty level



**HR+/HER2+** ..... ➤ aka "Luminal B"

**10% of all breast cancer cases**

- Little geographic variation by state



**HR-/HER2+** ..... ➤ aka "HER2-enriched"

**5% of all breast cancer cases**

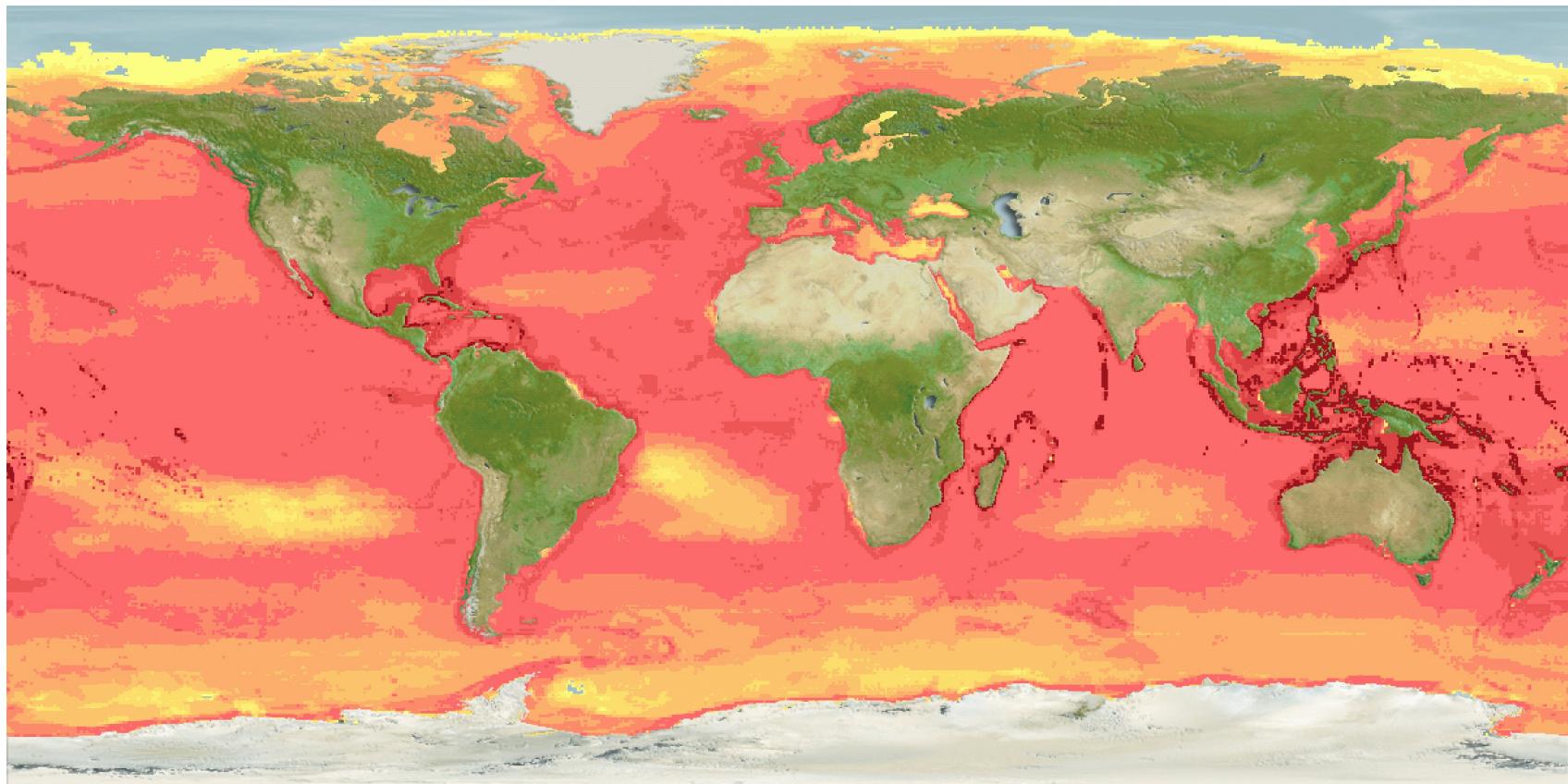
- Lowest rates for all races and ethnicities

[www.cancer.gov](http://www.cancer.gov)

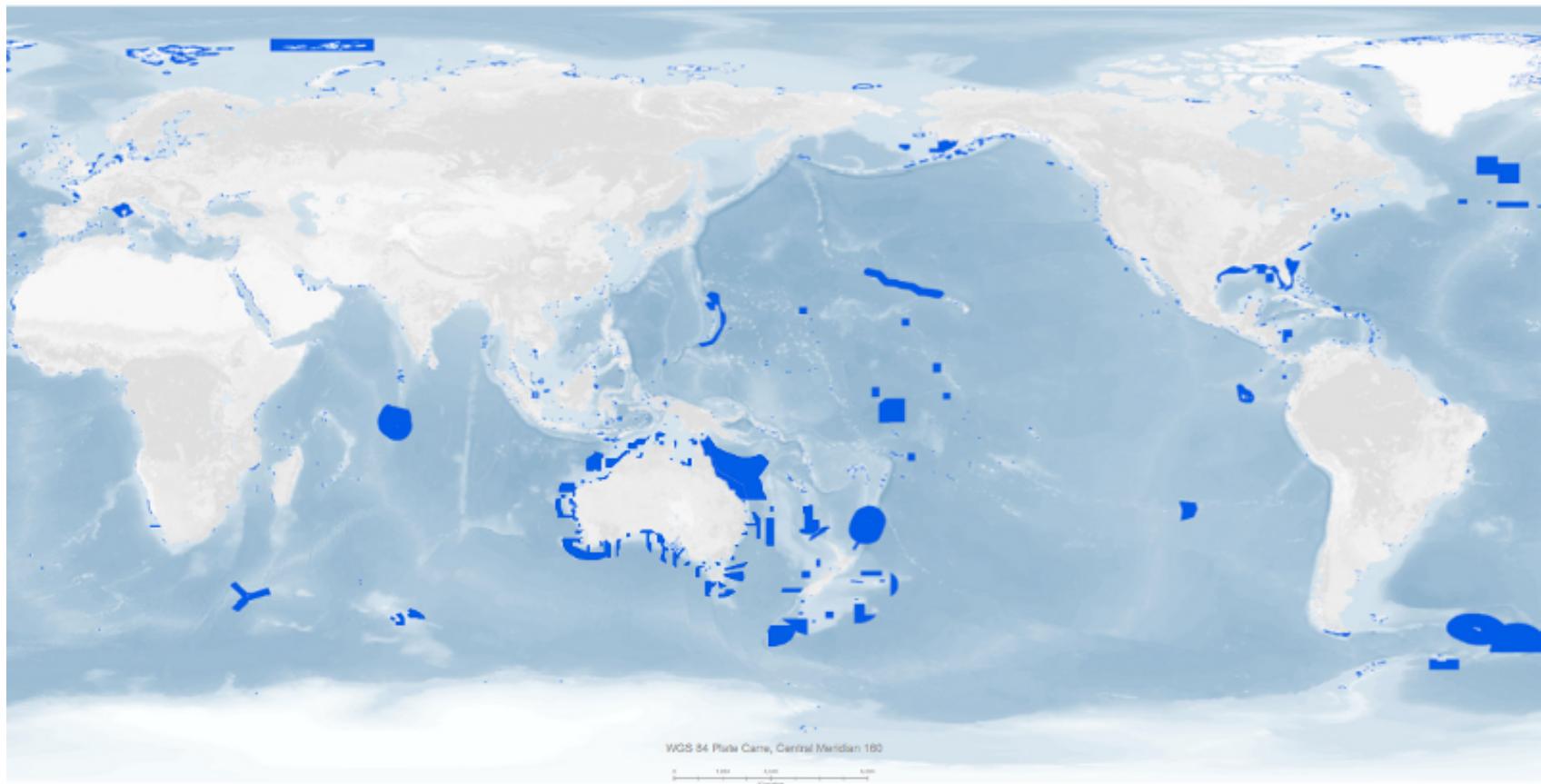
Source: Special section of the Annual Report to the Nation on the Status of Cancer, 1975-2011.

# Biodiversity

# How many species?



# Making conservation decisions

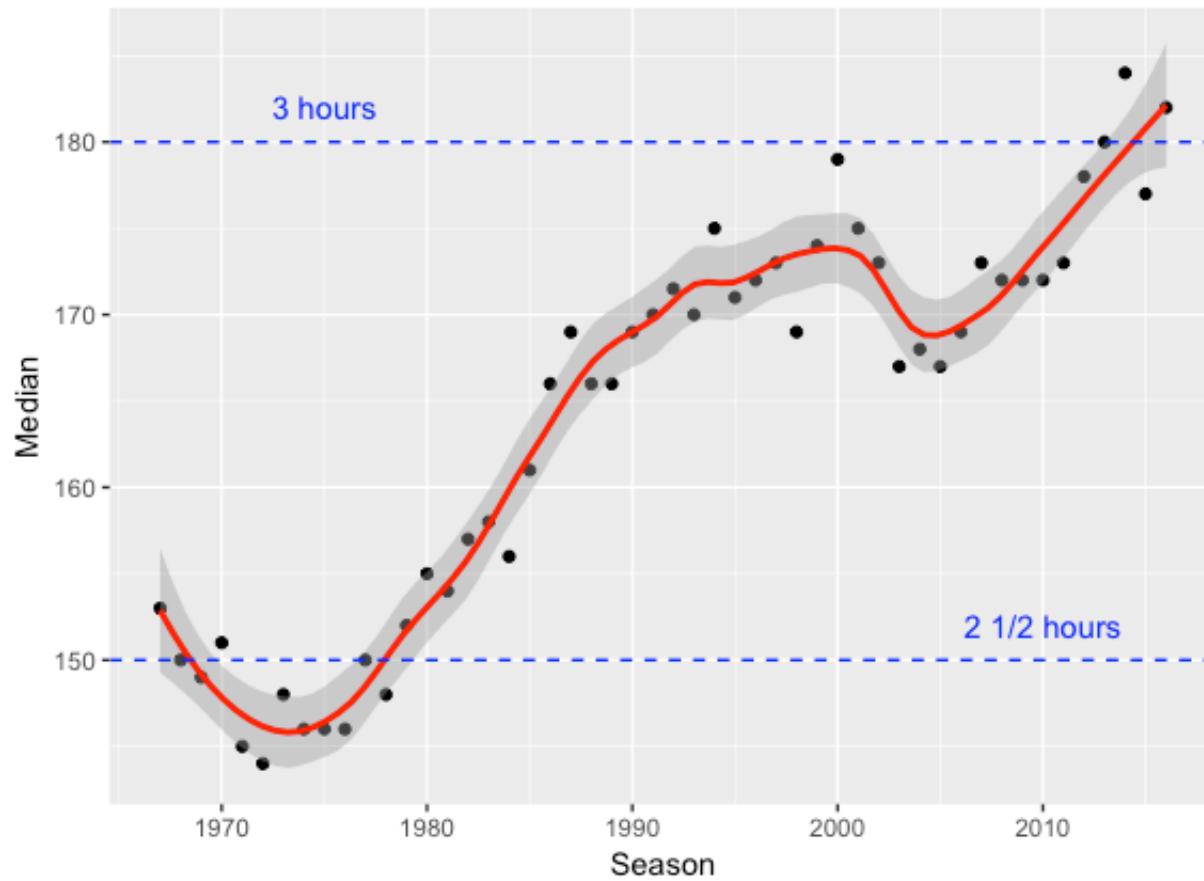


# Sports

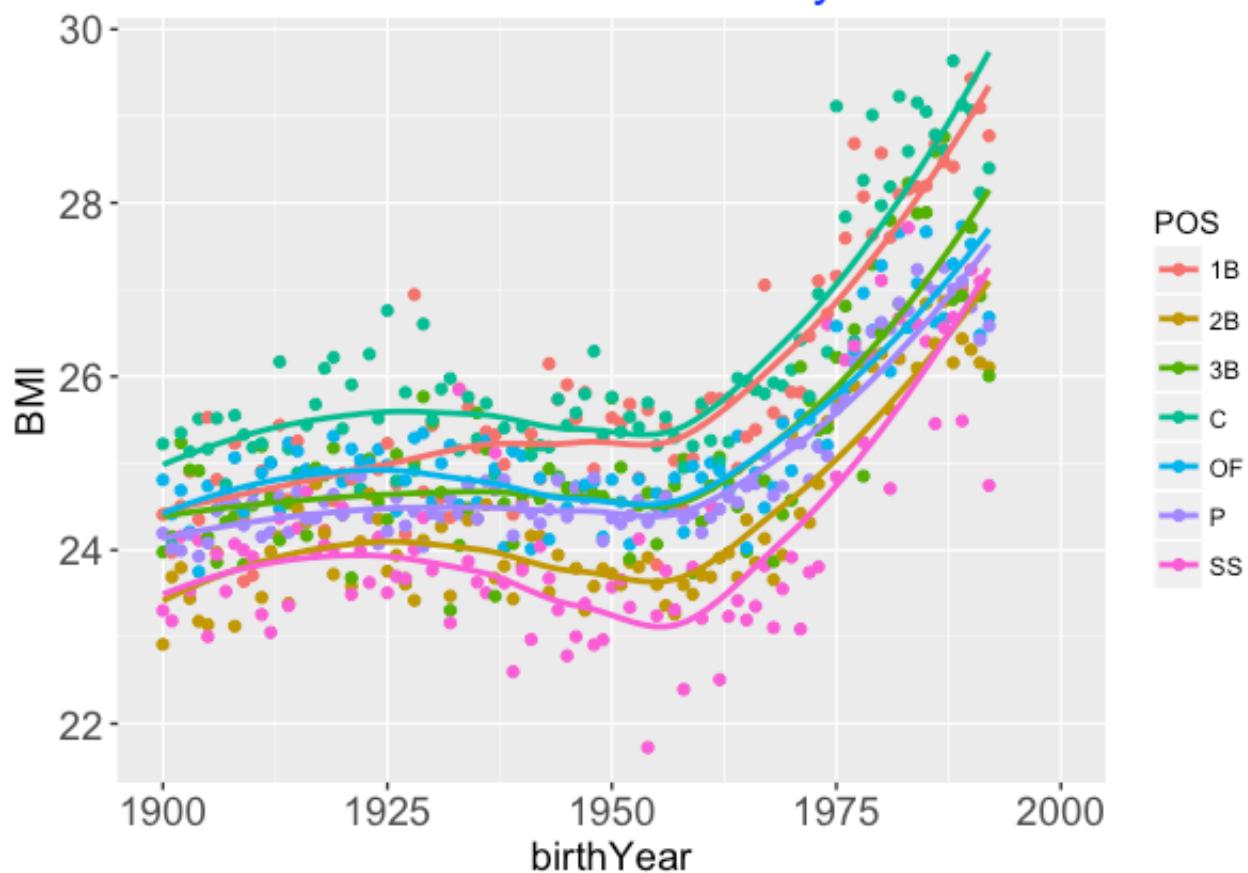
# Data

- Velocity, movement, release point, spin, and pitch location for every pitch thrown in baseball
  - How many fastballs did Justin Verlander throw up and in to righties in 2-2 counts from July to September at home?
- Batted ball location and the strike zone
- A hitter's tendencies against certain types of pitches in certain counts

### Median Game Duration: 1967:2016



## Mean BMI of MLB Players



What is this player going to contribute to the club?

Does a basketball player's defense contribute?

# Does a basketball player's defense contribute?

TIM DUNCAN  
DEFENSIVE SHOT CHART

Players defended by Tim Duncan exhibit increased midrange efficiency, but Duncan...

... DISRUPTS PAINT SHOTS!



GRANTLAND

2013-14  
REGULAR SEASON

ROY HIBBERT  
DEFENSIVE SHOT CHART

Players defended by Roy Hibbert exhibit increases in both midrange activity and midrange efficiency, but...

... his presence greatly reduces their interior efficiency.



GRANTLAND

2013-14  
REGULAR SEASON

DWIGHT HOWARD  
DEFENSIVE SHOT CHART

Players defended by Dwight Howard exhibit increased midrange activity, but his assignments hardly ever even...

... attempt shots in the paint

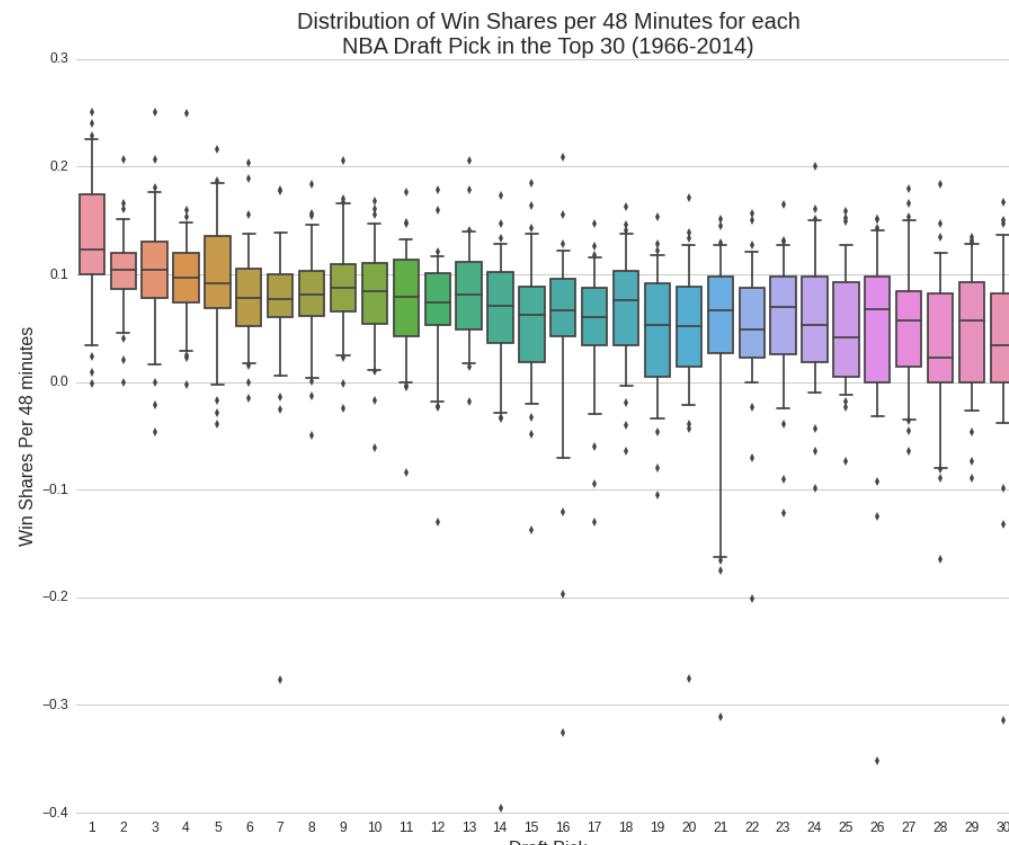


GRANTLAND

2013-14  
REGULAR SEASON

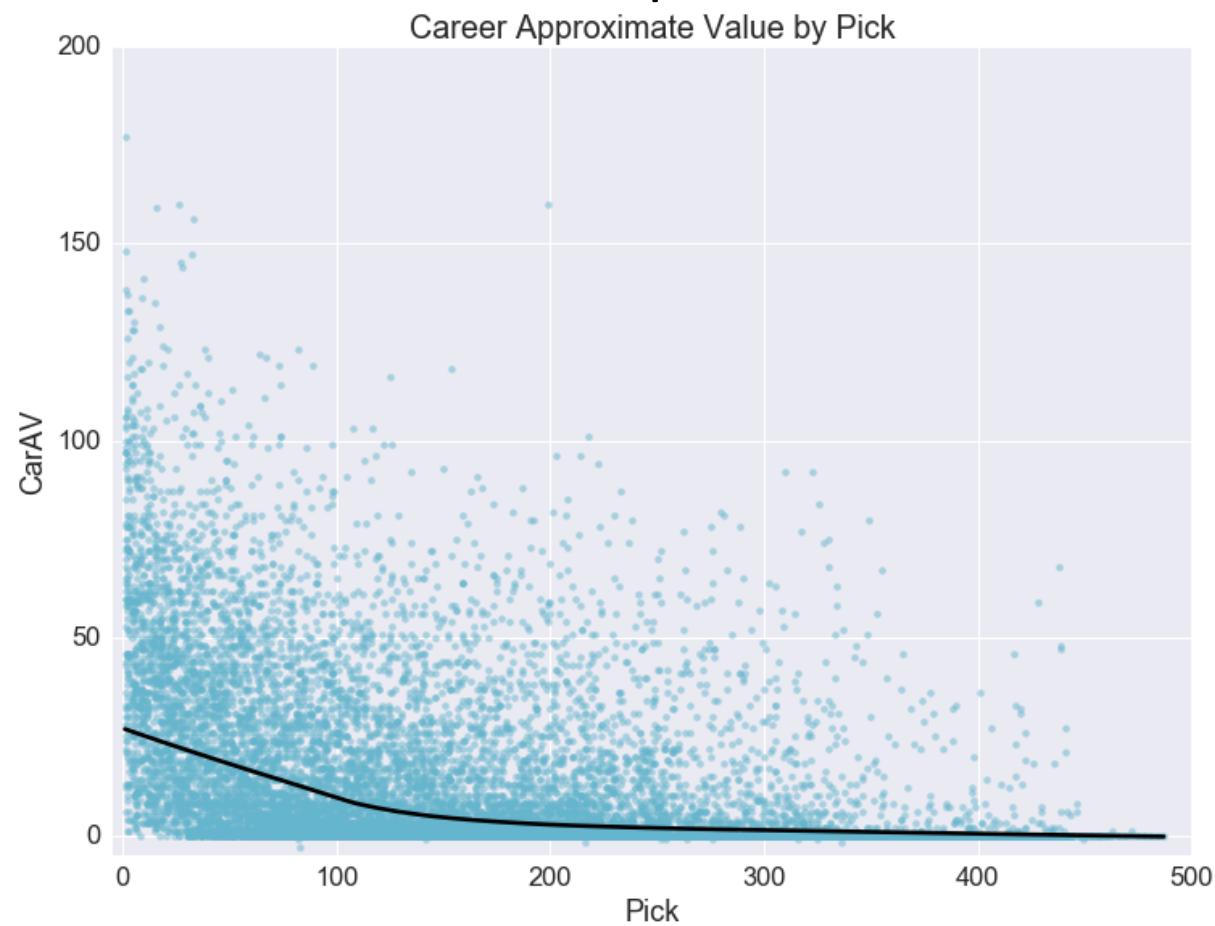
Does a number 1 draft pick contribute to wins?

# Does a number 1 draft pick contribute to wins?



Data source: <http://www.basketball-reference.com/draft/>  
Author: Savvas Tjortjoglou ([savvastjortjoglou.com](http://savvastjortjoglou.com))  
Note: Whiskers represent the 5th and 95th percentiles

# Does a number 1 draft pick contribute to wins?



What insights can improve performance?

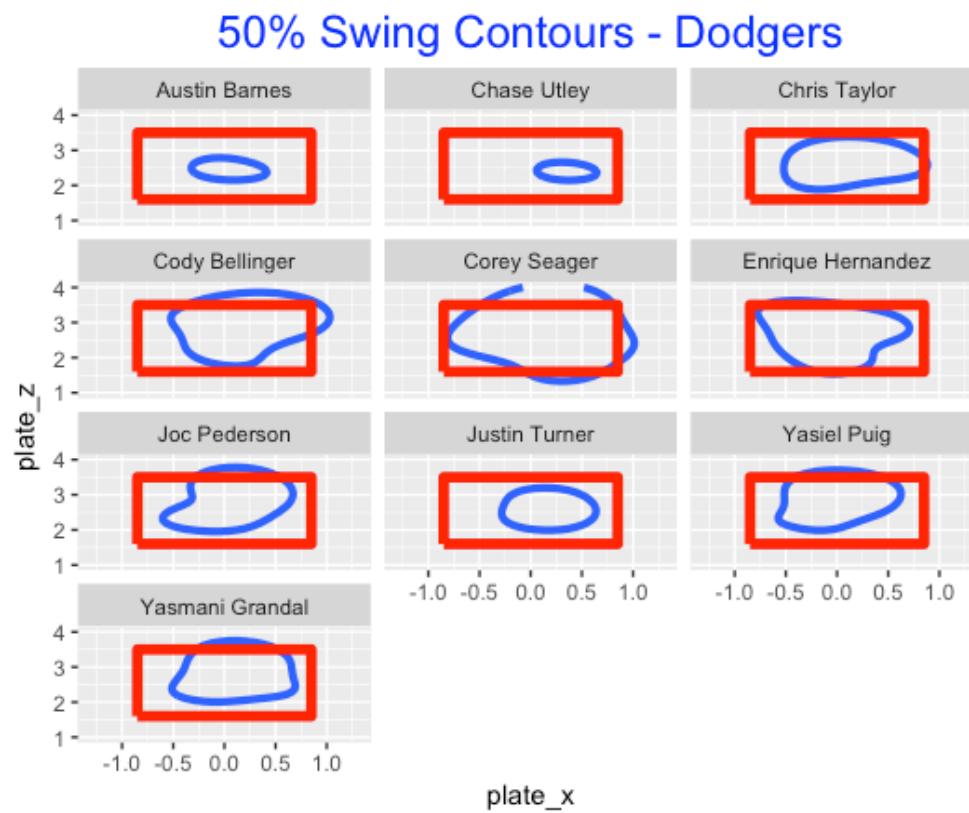
How can a coach alter strategies?

# How can a coach alter strategies?



How do we pitch to a particular batter?

# How do we pitch to a particular batter?



Does a fast fastball indicate a good game?

# Does a fast fastball indicate a good game?

