

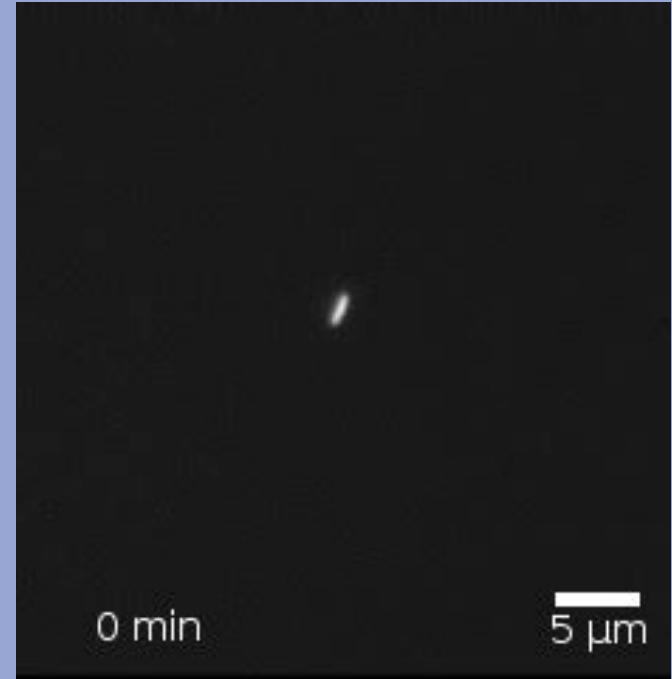
when romaine bites back

an investigation of E.coli outbreaks

Camellia Hilker

what is E.coli?

- Naturally found in gut
- Can cause foodborne illness
 - O157:H7/Shiga toxin
 - No direct treatment
- Optimally grows from 35-42°C (~95-107°F)
- Reproduces fast



recent/notable E.coli outbreaks

- 2018 - Romaine Lettuce
 - 210 cases
 - O157:H7
- 2015 - Chipotle Restaurants
 - 55 cases
 - O26
- Beef
 - Happens periodically
 - More common in packaged ground beef



can we predict how many illnesses will occur?

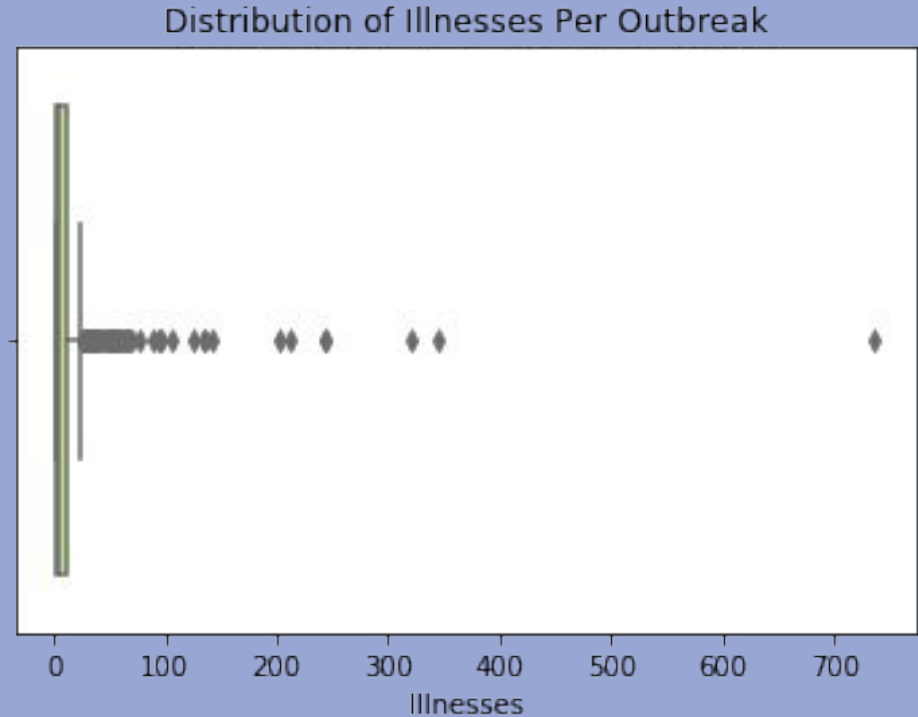
- Data from CDC website
- US Climate Data
- State stats
 - Number of restaurants in State
 - % Adults who eat fruit/veg
 - Land area
 - Population density
 - Human Development Index
- Strain specific data
 - %GC content, %Protein coding genes



(not modeling an actual E.coli outbreak)

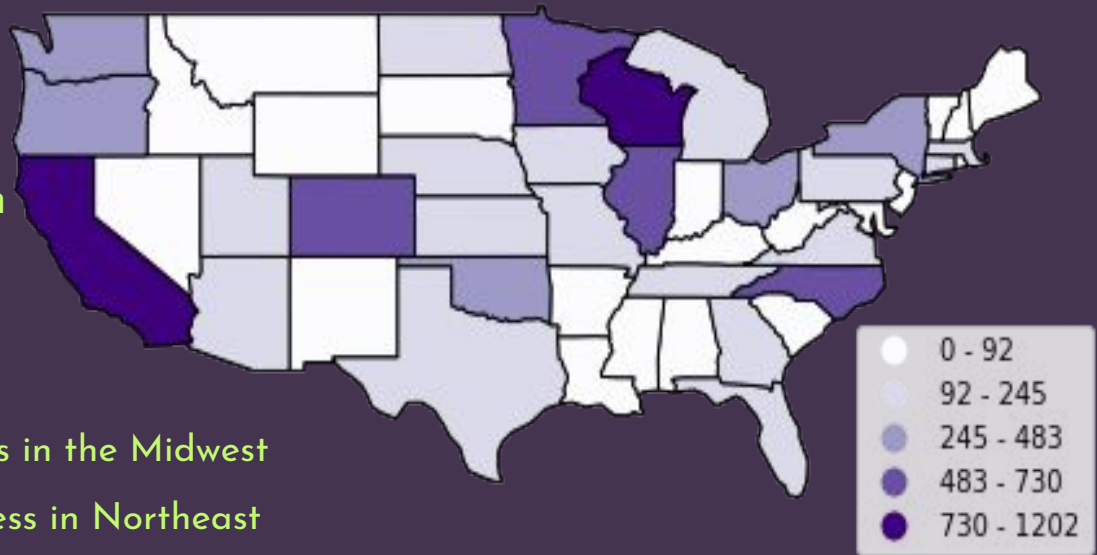
How many people “usually” get sick?

- Mean: 13.7
- Outliers
 - Wisconsin - 736 illnesses in 2000
 - Sizzler restaurants
 - Oklahoma - 344 illnesses in 2008
 - Country Cottage restaurants
 - Illinois - 321 illnesses in 1999
 - Downstate Labor Day party



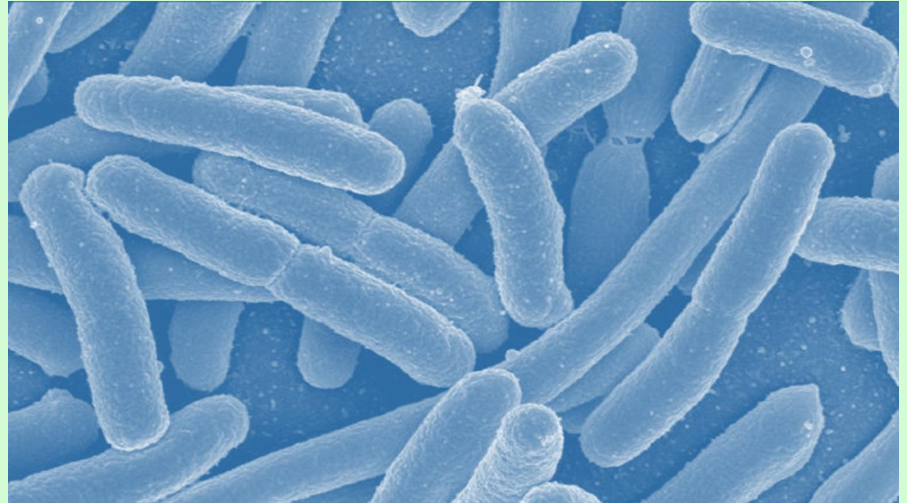
"best" model

- Keep outliers
- Lasso and $\log(y)$
- Dummy Strain and Region
- Train and Test $R^2 = 0.031$
- Regional differences
 - Slightly higher rate of illness in the Midwest
 - Slightly reduced rate of illness in Northeast
- Slightly higher rate of illness if strain is O157:H7



conclusions/future considerations

- Better data
 - Illnesses Reported vs. Actual
 - FDA regulated O157:H7 in 1994
 - Restaurant vs. consumer product
- E.coli infection is unpredictable
 - Proper food handling
 - Weaker populations are more susceptible
 - Can be transmitted from sources other than food



appendix

