Homework 8

Kavya Malgi

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Github Link: https://github.com/kavyamalgi/Homework8

Problem 1: Regression Warm Up

A) What creatinine clearance rate should we expect for a 55 year-old? Explain briefly (one or two sentences + equations) how you determined this.

After running the regression model equation, I calculated the intercept as 147.81292 and the slope as -0.61982. Using this we can say our equation is:

creatclear = 147.81292 - 0.61982(age)

For a **55 year old man**:

creatclear(55 years) = **113.72**

So based on the fitted linear model, we'd expect a 55 year old to have a creatinine clearance rate of 113.72 mL/min per year

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B) How does creatinine clearance rate change with age? (This should be a single number whose units are ml/minute per year.) Explain briefly (one or two sentences) how you determined this.

The creatinine clearance rate decreases by 0.61982 mL/min per year for each additional year of age.

I determined this by looking at my regression output from the summary(creat_model) and looked at the coefficient for age.

C) Whose creatinine clearance rate is healthier (higher) for their age: a 40-year-old with a rate of 135, or a 60-year-old with a rate of 112? Explain briefly (a few sentences + equations) how you determined this.

Using the regression equation:

<u>**40 year old:**</u>

147.81292 - 0.61982(40) = **123.02012**

<u>**60 year old:**</u>

147.81292 - 0.61982(60) = **110.62372**

Compare actual - expected:

40 year old:

135 - 123.02012 = **11.97988**

60 year old:

112 - 110.62372 = **1.37628**

After calculating the expected using the regression equation and comparing the actual (given) - expected (calculated), the 40 year old's creatinine clearance rate is farther above the expected value by about 12 mL/min per year, compared to the 60 year old who is only about 1.4 above the expected value.

Therefore we can conclude that the 40 year old has the healthier creatinine clearance rate for their age.

Problem 2: Modeling Disease Growth

1) An estimated growth rate and doubling time for Italy, with 95% bootstrapped confidence intervals for each.

Estimated Growth Rate for Italy: 0.183/day

Growth Rate CI for Italy: (0.159, 0.208)

Estimated Doubling Time for Italy: 3.8 days for daily deaths to double

Doubling Time CI for Italy: (3.3, 4.4)

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2) An estimated growth rate and doubling time for Spain, with 95% bootstrapped confidence intervals for each.

Estimated Growth Rate for Spain 0.276/day

Growth Rate CI for Spain: (0.233, 0.319)

Estimated Doubling Time for Spain: 2.5 days for daily deaths to double

Doubling Time CI for Spain: (2.2, 3.0)

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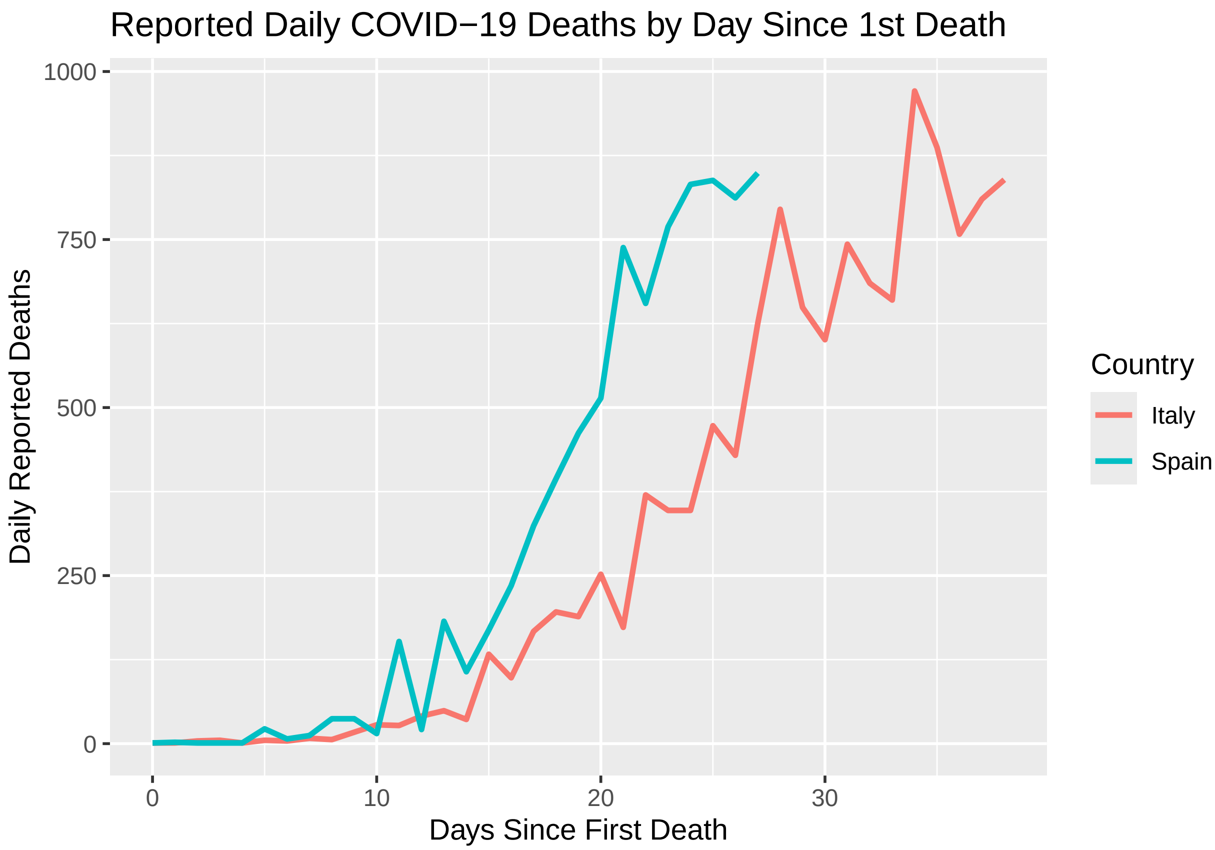
3) A line graph showing reported daily deaths over time (using days_since_first_death, rather than calendar date, as the relevant time variable) in each country. Your line graph should have two lines, one for each country, distinguished by their color.



Problem 3: Price Elasticity of Demand

In light of the data, what is the estimated price elasticity of demand for milk? Give a 95% bootstrapped confidence interval for this quantity. Briefly describe what you did to estimate the elasticity – no more than a few sentences, together with your estimate + interval.

log(sales) = intercept + slope(log(price))

The Estimated Elasticity: -1.619

I estimated the price elasticity of demand for milk by using a log-log linear regression of quantity purchased on price. This means that a 1% increase in price leads to a 1.62% decrease in quantity demand, meaning elastic demand. I then found the 95% bootstrapped confidence interval as (-1.771, -1.439). This means that we are 95% confident that the true price elasticity of demand for milk lies between the interval.