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Covid19 Deaths: An Explanatory Model

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www.StatLit.org/pdf/
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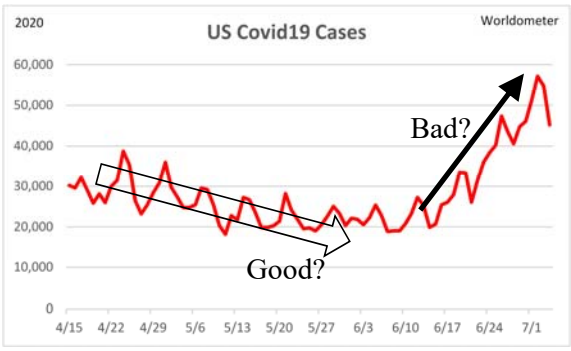
US COVID-19 CASES



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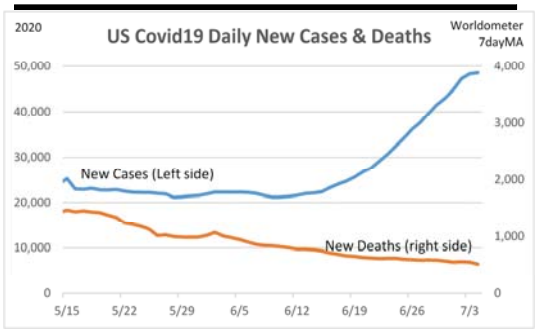
Association: Co-variation. As Cases ⇧; Deaths ⇩



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What explains lower death rate?

Change how things are counted or measured:

- More sensitive tests: more false positive cases
- Covid deaths now exclude non-Covid causes

Change reality:

- Improved medical care. Data not yet available.
- Change in mixture (confounding)
  What is the biggest confounder?
  Must vary: "takes a change to explain a change"

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Model Confounder Change: What is death rate by age?

Death Rate of Cases		Health Problems*	
Age	ALL (5/31)	Some	None
5	0.1%	0.6%	0.1%
15	0.1%	0.8%	0.1%
25	0.1%	1.4%	0.1%
35	0.4%	1.0%	0.1%
45	2.4%	4.5%	0.4%
55	2.4%	7.8%	0.9%
65	6.7%	16.7%	2.4%
75	16.6%	31.7%	10.2%
85	28.7%	49.7%	20%**(30%)

Table 3: www.cdc.gov/mmwr/volumes/69/wr/mm6924e2.htm
* Half of the deaths lack health condition
** 19.7% is estimated; (29.8% was recorded)

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Death Rate among Cases by Age: Assign Ages to Two Groups

CASES by Age group (yrs)								
≤9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	≥80
20,458	49,245	182,469	214,849	219,139	235,774	179,007	105,252	114,295
1.5%	3.7%	13.8%	16.3%	16.6%	17.9%	13.6%	8.0%	8.7%

DEATHS by Age group (yrs)								
13	33	273	852	2,083	5,639	11,947	17,510	32,766
0.0%	0.0%	0.4%	1.2%	2.9%	7.9%	16.8%	24.6%	46.1%

DEATH RATE (per 1,000 and %) by Age group (yrs)								
0.6	0.7	1.5	4.0	10	24	67	166	287
0.1%	0.1%	0.1%	0.4%	1.0%	2.4%	6.7%	16.6%	28.7%

AVERAGE DEATH RATE (%) UP TO AGE SHOWN and DOWN TO AGE SHOWN								
0.1%	0.1%	0.1%	0.3%	0.5%	1.0%	1.9%	3.2%	5.4%
5.4%	5.5%	5.7%	6.6%	8.2%	10.7%	15.6%	22.9%	28.7%

Table 3: www.cdc.gov/mmwr/volumes/69/wr/mm6924e2.htm USA as of 5/30/2020

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The Cases-Deaths Association: Confounded by Age-Risk Mix

We need a simple ***explanatory model***.
Assume two groups based on risk of death:

- Death rate: High risk (R1), Low risk (R2)
  Let F1 = Fraction of cases in high risk group

Deaths = Cases*[F1*R1 + (1-F1)*R2]

Select death rates for each group: R1 > R2

- Max(Deaths/Cases) = 8.2%. So let R1 = 10%
- Min(Deaths/Cases) = 1.0%. So let R2 = 0.1%

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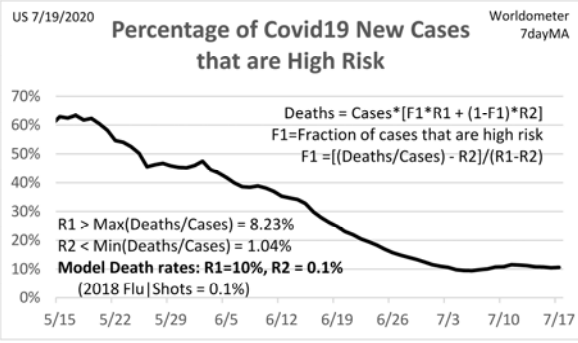
Two-Group Risk Model



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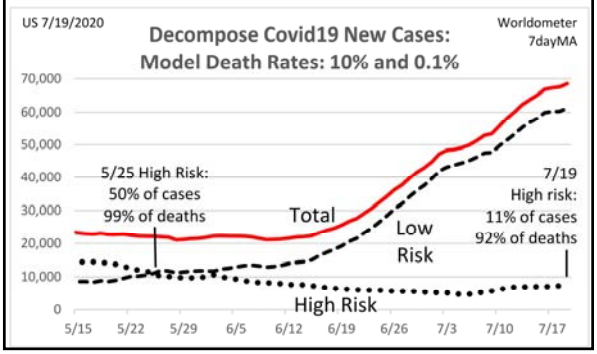
92% of Deaths from 11% of Cases. High Risk: Old with Health Problems



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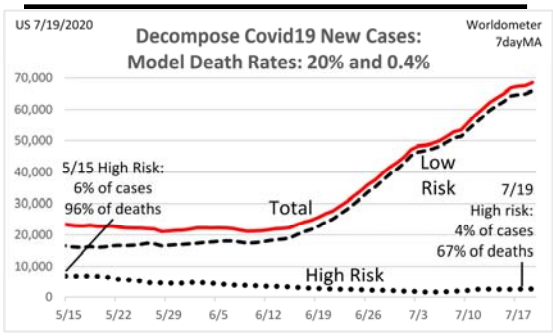
67% of Deaths from 4% of Cases. High Risk: Old with Health Problems



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Technical Summary

1. Smooth the data (7day average)
2. Model the data: Predict vs. Explain
3. Look for biggest confounder: Age-risk mix
4. Confounder must vary as data changes.
3. Choose a simple model to highlight essentials
4. Check model assumptions against real data.
5. Summarize results to highlight the findings
6. Help officials minimize deaths and flatten the curve without flattening the economy

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Statistical Education needs Statistical Literacy

Look at what was done here:

- Observational data; time series data, big data
- Model to explain (not trying to predict)
- Confounder that varies over time
- Create a simple 2-parameter model

None of these are taught in traditional intro stats.

These are more of the reasons why students need a confounder-based Statistical Literacy course.