

Coronavirus Covid-19: An Analysis

by

Milo Schield

ASA Fellow

Consultant: University of New Mexico

President: National Numeracy Network

March 8, 2020

www.StatLit.org/pdf/

2020-Schield-Covid19-Analysis-Slides-0308.pdf

Seasonal Viral Flu: A Basis for Comparison

In U.S. in 2018-19, influenza (viral flu*) caused

- 36 million illnesses,
- 491,000 hospitalizations and
- 34,200 deaths this season

Death rate: 10 per 100,000 illnesses (0.01%)

Influenza is high-frequency, low-severity.

Statistics modeled actuarially (multipliers) or epidemiologically (attributable).

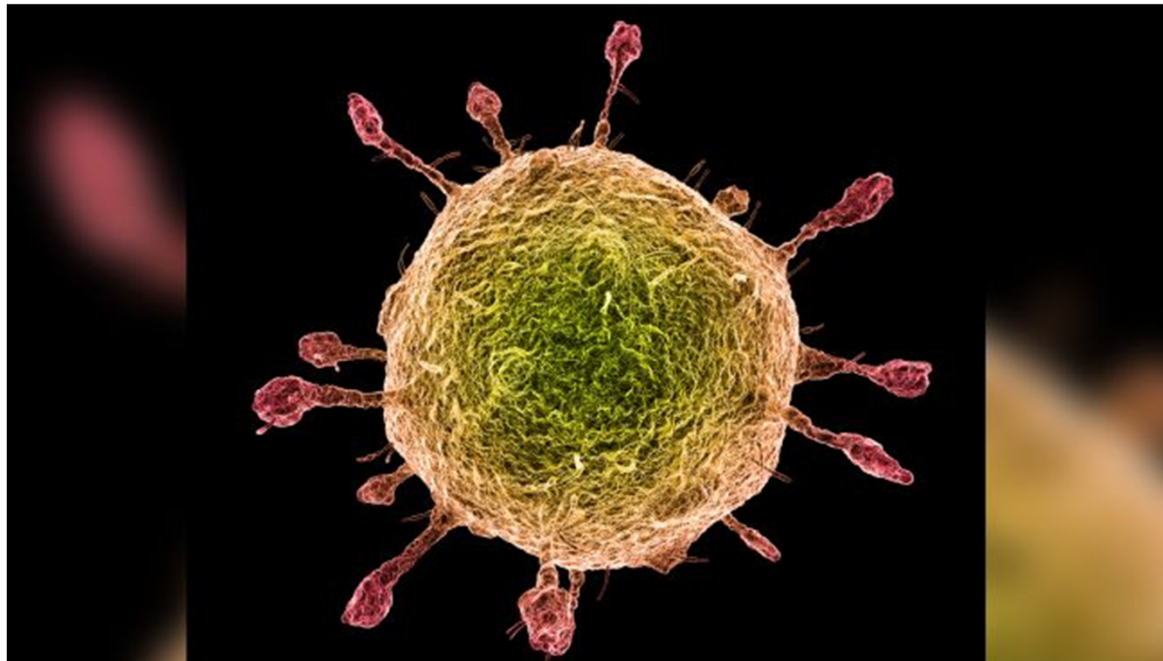
For more on attributable models, see www.statlit.org/pdf/2011SchieldISI.pdf

<https://www.cdc.gov/flu/about/burden/2018-2019.html>

<https://www.livescience.com/new-coronavirus-compare-with-flu.html>:

Corona-virus: Name & Reproducibility

Corona: Named for the spikes on their surface



Average number of people who catch the virus from a single infected person:

- Common cold: 1.3
- Covid-19: 2 – 3.

Source: www.livescience.com/new-coronavirus-compare-with-flu.html

Types of Corona-viruses

Death Rate, Deaths, Cases

Common Corona-viruses:

- 0.2% Swine flu: 12,000 deaths / 200,000 cases
- 0.1% US flu: 34,000 deaths / 36 million cases

Big Three Corona Viruses: (world-wide):

- 35%: MERS. 2,500 deaths / 8,500 cases
- 10%: SARS. 774 deaths / 8,098 cases
- 1-3%: COVID-19. <In process>

1) Common flu per year: <https://jcm.asm.org/content/46/7/2368>

2) 2018-19 US influenza deaths: www.cdc.gov/flu/about/burden/2018-2019.html

3) MERS: www.who.int/emergencies/mers-cov/en/ 4) SARS: www.nhs.uk/conditions/sars/

COVID-19

Source and Consequences

Q1. What are ways “cases” could be defined?

Q2. How might “confirmed” be defined?

WHO and China
Nat. Health Service

Cases: Covid-19 (China data)		
55,924	Confirmed	2/28/20
72,314	All	2/11/20
All = Confirmed + Suspected		
www.worldometers.info/coronavirus/		
coronavirus-age-sex-demographics/		

Percentage of Covid-19 confirmed cases who had ...	
80.1%	<i>Mild to moderate disease</i> (which includes non-pneumonia and pneumonia cases),
13.8%	<i>Severe disease:</i>
	* dyspnea [shortness of breath]
	* respiratory frequency \geq 30 minute,
	* blood oxygen saturation \leq 93%,
	* PaO ₂ /FiO ₂ ratio < 300 and/or
	* lung infiltrates 50% of lung field 24-48 hr
6.1%	<i>Critical</i> (respiratory failure, septic shock, and/or multiple organ dysfunction/failure)
100.0%	All

Q3. More influential: Sex or Age?

Q4. Influence of Incubation?

Death Rate	Confirmed	All
Male	4.7%	2.8%
Female	2.8%	1.7%
All	3.8%	

Covid-19: China data 2/2020

Death Rate	Confirmed	All
80+	21.9%	14.8%
70-79		8.0%
60-69		3.6%
50-59		1.3%
40-49		0.4%
10-39		0.2%
0-9		None

Covid-19: China data 2/2020

Covid19 (Time)	Interval
Infection to Symptom	3 days
Symptom to Death	2-8 weeks
Recovery from Mild	2 weeks
Recovery from Severe	3-6 weeks

www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf

Q5. If Age=___ & Pre-Existing=No, what would Death Rate be?

Covid-19 Death Rates by Age

Death Rate	Confirmed	All
80+	21.9%	14.8%
70-79		8.0%
60-69		3.6%
50-59		1.3%
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Covid-19: China data 2/2020

80% of deaths over 60.

Covid-19 Death Rates by Pre-Existing Condition

PRE-EXISTING	Confirmed	All
Heart	13.2%	10.5%
Diabetes	9.2%	7.3%
Lung	8.0%	6.3%
Hypertension	8.4%	6.0%
Cancer	7.6%	5.6%
no pre-existing	1.4%	0.9%

Covid-19 Death Rates: China data 2/2020

75% of deaths had a pre-existing condition

More Questions

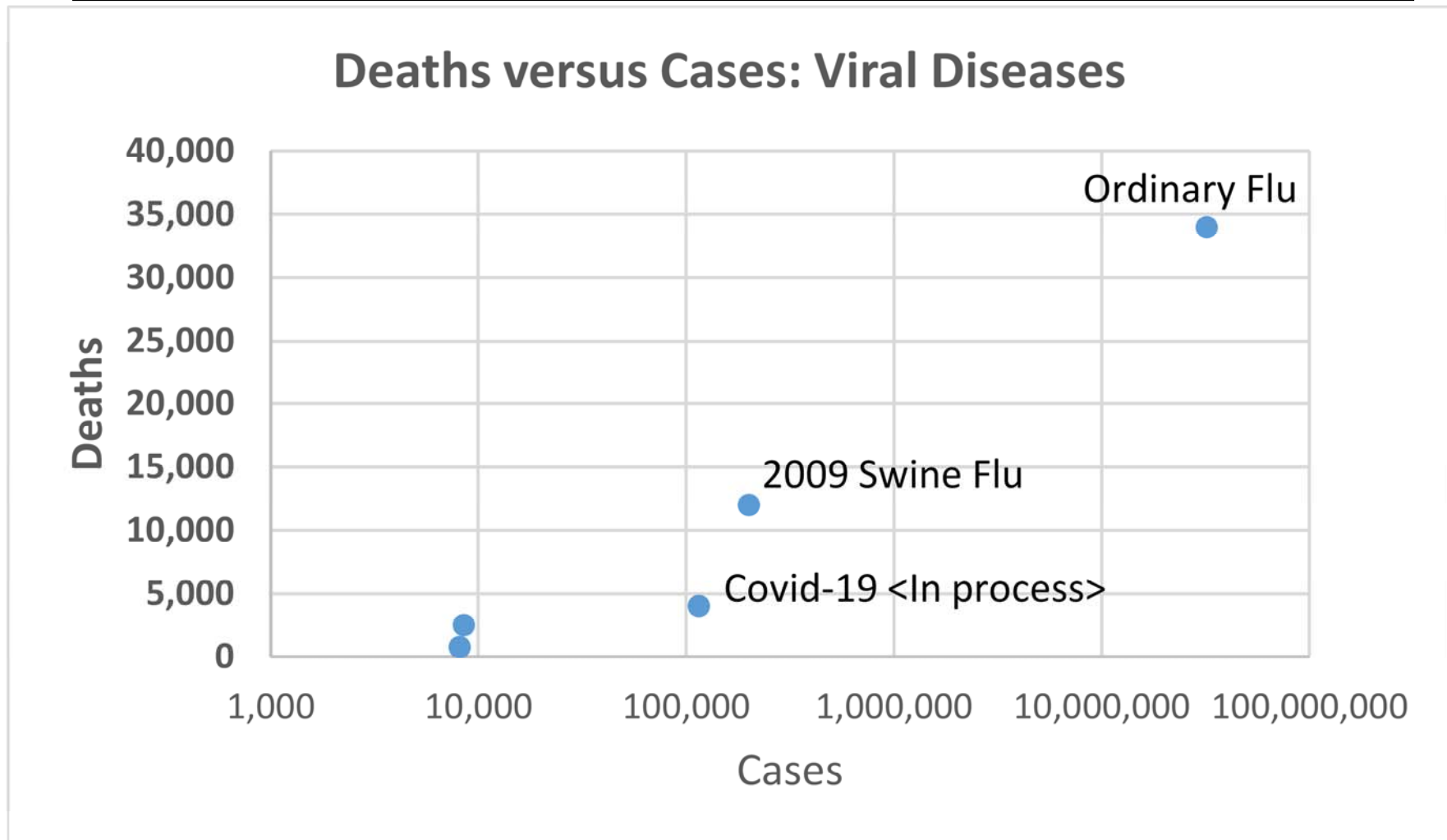
Q6: How could Covid-19 be both?

- a killer disease (kill more people than SARS)
- low-severity (lower death rate than SARS)

Q7. How worried should seniors be if they don't have any pre-existing conditions?

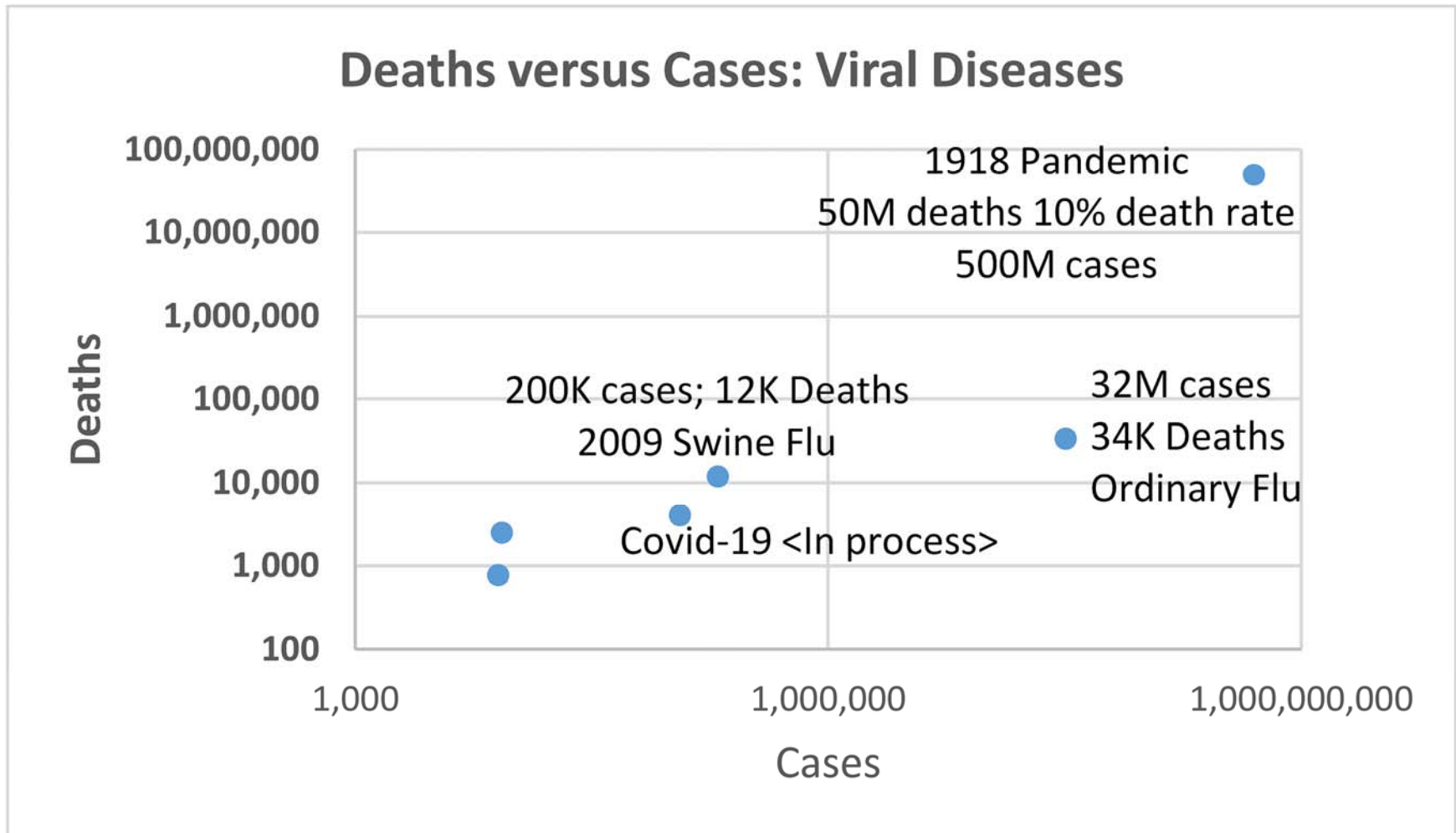
Q8: Should a young person (<60) with no pre-existing conditions worry if they are infected?

Compared to What? Ordinary Flu (Influenza)



Compared to What?

1918 Pandemic (Spanish Flu)



Root Cause?

How will this end?

What is the root cause of this problem?

1. Everyone is susceptible to this virus.
2. Everyone infected is an unknowing carrier.
3. Infected carriers infect at least two others.

Without a vaccine, what will cause this to stop?

- If recoveries develop an immunity, then they will eventually block transmission.

www.youtube.com/watch?v=E3URhJx0NSw&feature=youtu.be

Conclusion

For this analysis, students need to understand rates, frequency, severity, confounding, assembly & bias.

Many – if not most – of these ideas **not** taught in:

- the traditional introductory statistics course,
- a Data Science program, or
- an inference-based Statistical Literacy course.

This is one more reason why students need a confounder-based Statistical Literacy course.

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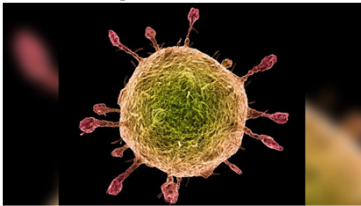
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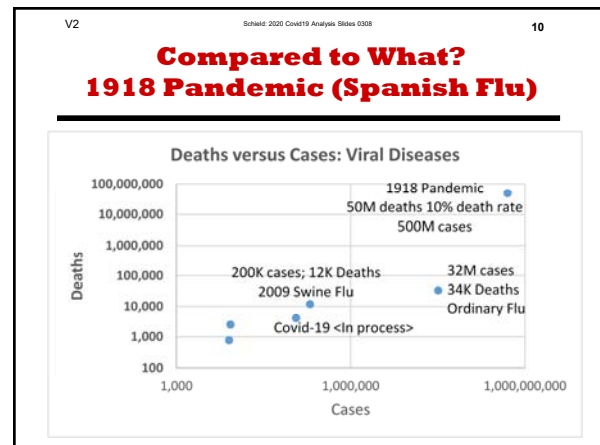
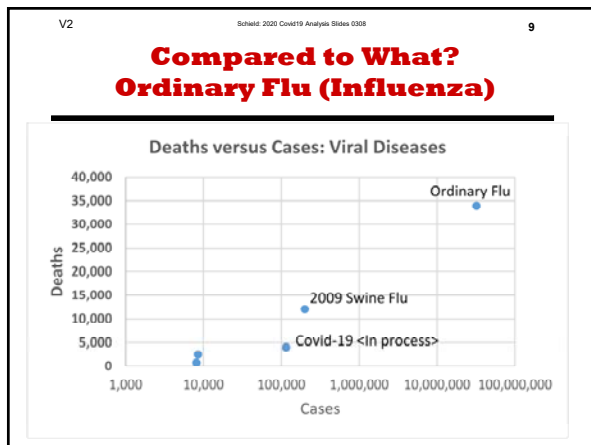
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