SEAC General Session

OLIVER WYMAN

ACTUARIAL CONSIDERATIONS IN THE WAKE OF COVID-19

June 25, 2020

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AGENDA

01	Background
02	Mortality
03	Modeling considerations

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BACKGROUND

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COVID-19 is an illness caused by the novel coronavirus; this is from the same family of viruses that cause the common cold as well as SARS and MERS

Transmission rate

- ~2X the Flu
- Measured as number of cases an infected person causes → R-naught (R0)
  - The Flu R0 = 1.3
  - COVID-19 R0 between 2 and 3
- Even in asymptotic and mild cases, individuals will be contagious

Containment

- Typically anything with an R0 greater than 1 warrants countermeasures like quarantines
- The incubation period is far longer at 2-14+ days vs. the Flu at 1-4 days, thus creating additional containment issues
- Data suggests that viral shedding continues beyond symptom resolution

Mortality

- 20% of cases have been considered severe, requiring hospitalization for supportive care
- Global case fatality rate (as of June 11): 5.7% of confirmed cases, much higher than the Flu
- Mortality is much higher for the elderly and those with pre-existing conditions

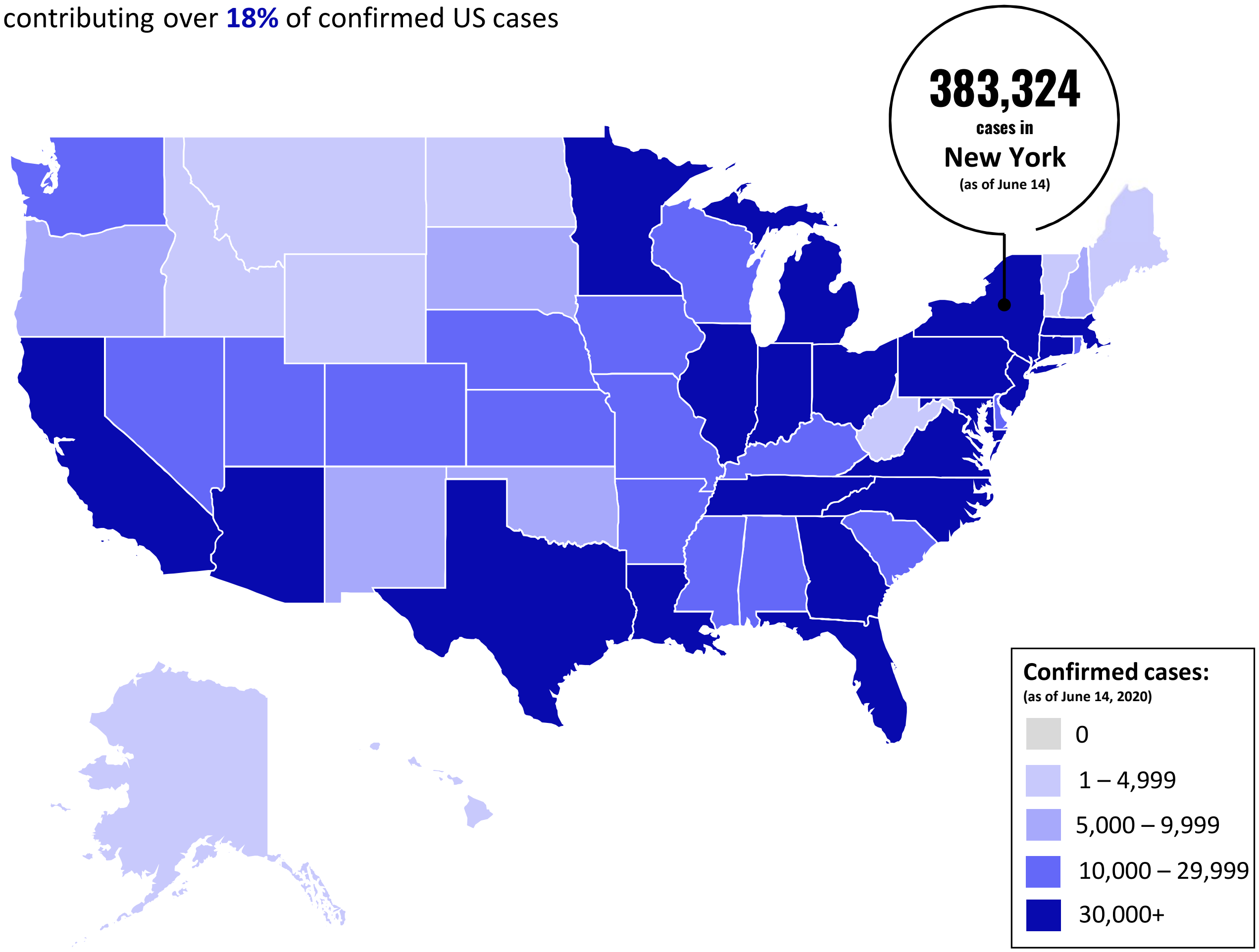
Unknowns

- COVID-19 is still relatively new with many unknown factors; insurers' exposure to this risk will need to be monitored closely
- Mortality mitigants:
  - Mortality rate could decrease over time as milder cases (~80% of all cases) are often going undiagnosed
  - We expect mortality rate to decrease as testing expands and antibody testing reveals undetected cases
- Mortality accelerants:
  - Hospital systems risk being overtaxed (ICU beds, ventilators, PPE) meaning case fatality rates could rise further

Source: Bing COVID-19 Tracker, China CDC, CDC, MedRxIv

COVID-19 SPREAD IN THE US

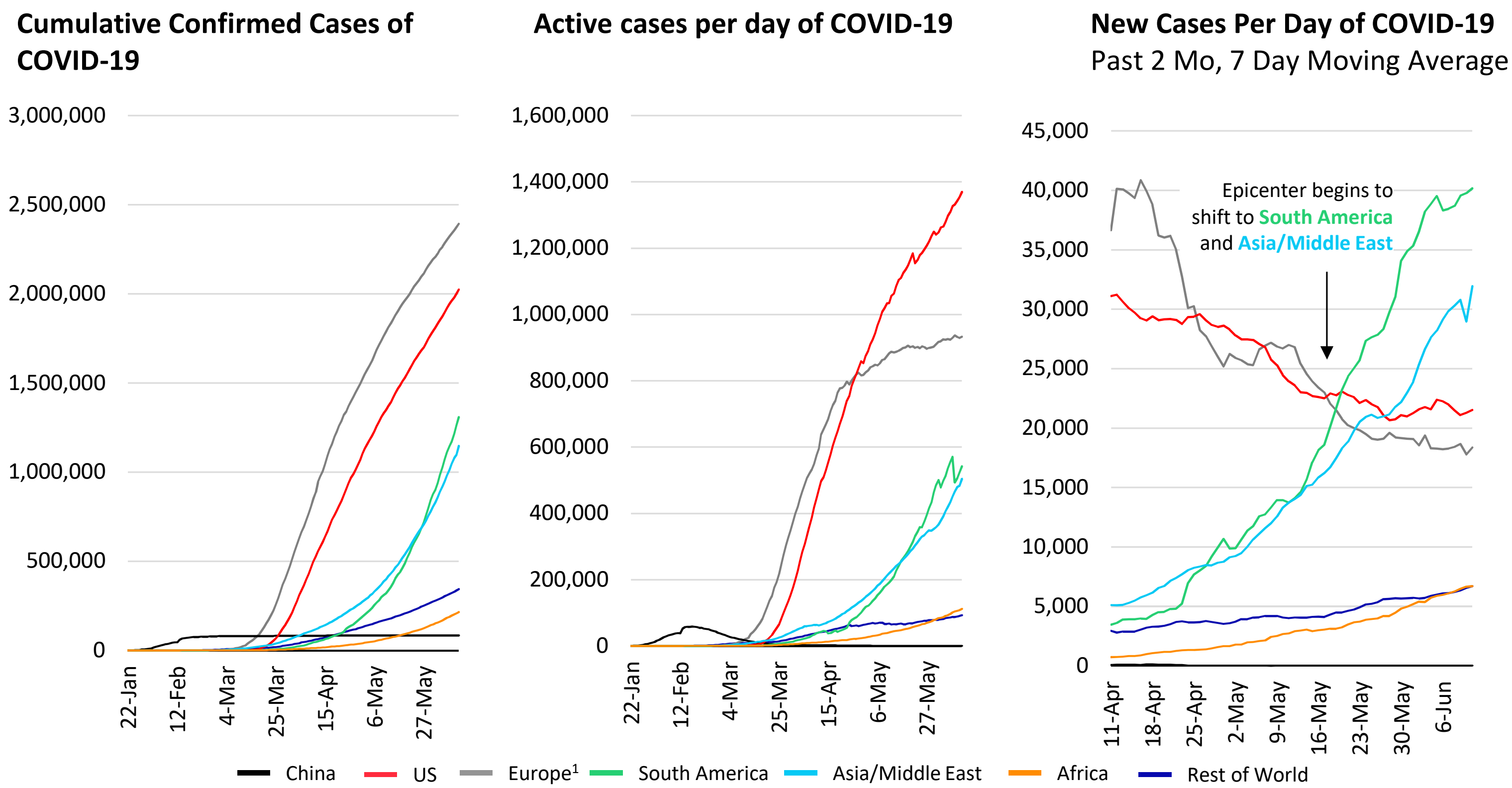
New York is at the epicenter, contributing over **18%** of confirmed US cases



Source: Numbers from John Hopkins University & Medicine, as of June 14, 2020

COVID-19 TRENDS AND SPREAD OF THE DISEASE

Cumulative confirmed cases continue to rise across the world, but the epicenter is beginning to shift away from Europe and towards South Asia, the Middle East, and South America



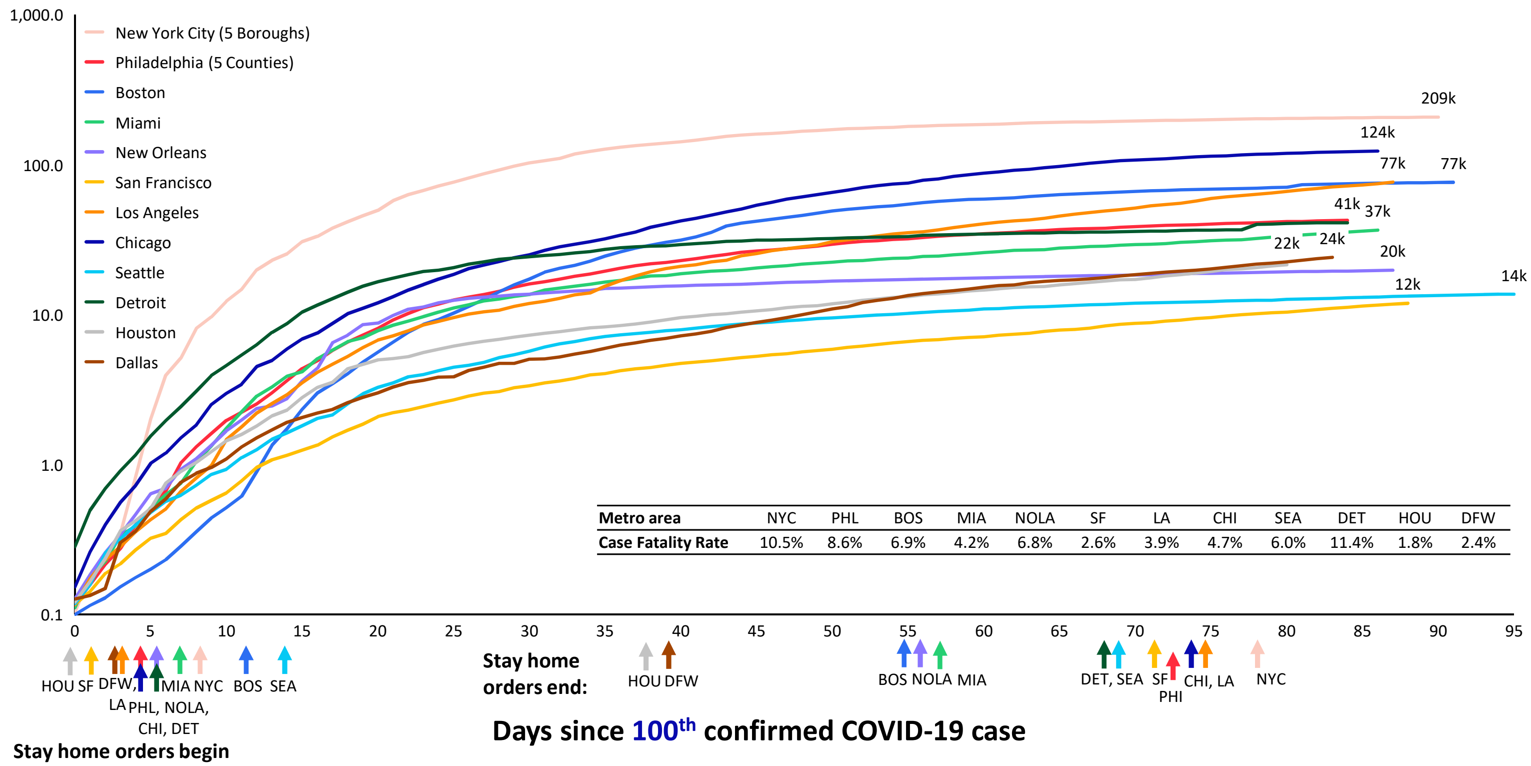
Source: John Hopkins University & Medicine Coronavirus Resource Centre

1. Includes countries categorized under "European region" based off of latest WHO Situation Reports

STAY AT HOME ORDERS HAVE SLOWED THE GROWTH OF THE DISEASE ACROSS KEY METRO AREAS IN THE UNITED STATES

Confirmed cases by US metro area

Log scale

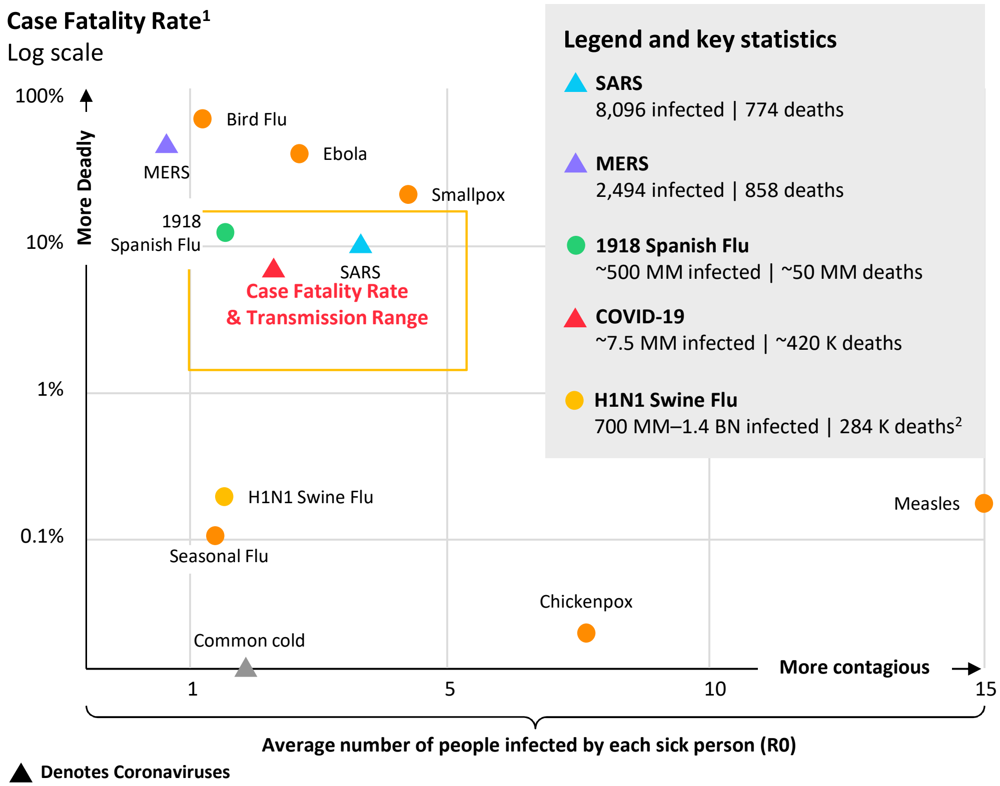


Metro area	NYC	PHL	BOS	MIA	NOLA	SF	LA	CHI	SEA	DET	HOU	DFW
Case Fatality Rate	10.5%	8.6%	6.9%	4.2%	6.8%	2.6%	3.9%	4.7%	6.0%	11.4%	1.8%	2.4%

Data: USA Facts County Level Data as of 6/11/2020. Stay at home orders data from New York Times.

HOW DOES COVID-19 COMPARE TO OTHER DISEASE OUTBREAKS?

COVID-19 is currently more deadly and contagious than the Flu, but the science on transmission and mortality continues to evolve



Additional details

- R-naught (R0) represents the number of cases an infected person will cause
  - Initial estimates suggested COVID-19 R0 is between 2 and 3 (with edge of range estimates closer to 1.4 and 3.6), which means each person infects 2–3 others[3]; R0 for the seasonal flu is around 1.3[4]
  - New emerging estimates suggest R0 may be closer to 5.7 (edge of range 3.8–8.9)[6]
- Early evidence suggests COVID-19's transmission is highly variable, with most infections resulting in no subsequent infections and a few resulting in many, which should color response[7]
- The global case fatality rate for confirmed COVID-19 cases is currently 5.7%[5] according to WHO's reported statistics versus 0.1% for the seasonal flu; the rate varies significantly by country (e.g. Italy – 14.5%, South Korea – 2.3%[5])
- We expect case fatality rates to fluctuate as testing expands identifying more cases and as existing cases are resolved

1. New York Times (link) for fatality and R-naught comparisons, CDC timelines for case numbers (selected link: CDC SARS timeline); 2. Updated CDC estimates (link); 3. The R0 for the coronavirus was estimated by the WHO to be between 1.4–2.5 (end of January estimate) (link), other organizations have estimated an R0 ranging between 2–3 or higher (link); 4. CDC Paper (link); 5. Calculated as Number of Deaths/Total Confirmed Cases as reported by John Hopkins University. 6. Emerging Infectious Diseases (link) 7. Science (link)

COMPARISON TO PAST EVENTS

The current COVID-19 United States death toll has passed some historical pandemics; however, it is only a fraction of 1918 flu levels

Year	Description	Region	Global death toll (000s, approx.)	US death toll (000s, approx.) *Brackets: additional # of deaths per 1000 persons*
1906	Great Earthquake and Fire	San Francisco, CA	3	3
1918	Spanish Flu	International epidemic	50,000	675 [6.54]
1928	Okeechobee Hurricane	Puerto Rico, Bahamas, U.S.	4	2.5 [0.02]
1931	Central China Floods	Central China	3,700	0
1952	Polio Epidemic	U.S.	3.1	3.1 [0.02]
1957	Asian Flu	International epidemic	2,000	70 [0.41]
1968	Hong Kong Flu	International epidemic	1,000	36 [0.18]
1980	Summer heat wave	California	10	10 [0.04]
2004	Indian Ocean Earthquake	Bangladesh and West India	230	0
2005	Hurricane Katrina	Southern U.S.	1.8	1.8 [0.01]
2009	H1N1 Flu	International epidemic	280	12.5 [0.04]
2020	COVID-19	International epidemic	403	116 [0.35]

115,735 US deaths reported to date (June 14), but evolving

Values in blue mark pandemic events

Source: Oliver Wyman research and analysis, John Hopkins University & Medicine, as of June 14, 2020

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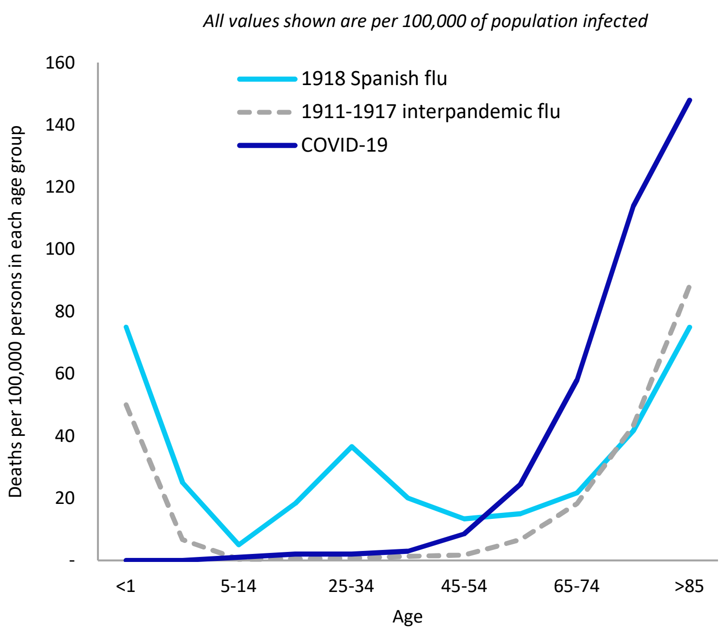
MORTALITY

DEATHS BY AGE

COVID-19 exhibits a different mortality curve than historical pandemics; the chart below shows deaths per 100,000 persons in each age group for the 1918 Flu pandemic, 1911-1917 interpandemic period, and COVID-19



Commentary

- Most pandemics follow a “U-shaped” mortality curve where most deaths are due to secondary pneumonia infection in immunocompromised people (mostly young and old)
- The 1918 Spanish Flu was partly so devastating because the mortality rates spiked for young adults likely due to “cytokine storm”, resulting in its “W-shape”
- COVID-19 follows an unusual “L-shaped” distribution that disproportionally impacts individuals over 55 years old
- Exposure to COVID-19 needs to be considered in the context of each insurer’s inforce block demographics and may not match the overall impact to the general population

Potential COVID-19 mortality impacts should be modeled by age rather than a single additive factor

Source: Taubenberger and Morens 2006, pp. 15-22; China CDC Weekly. Vital Surveillances: The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) — China, 2020

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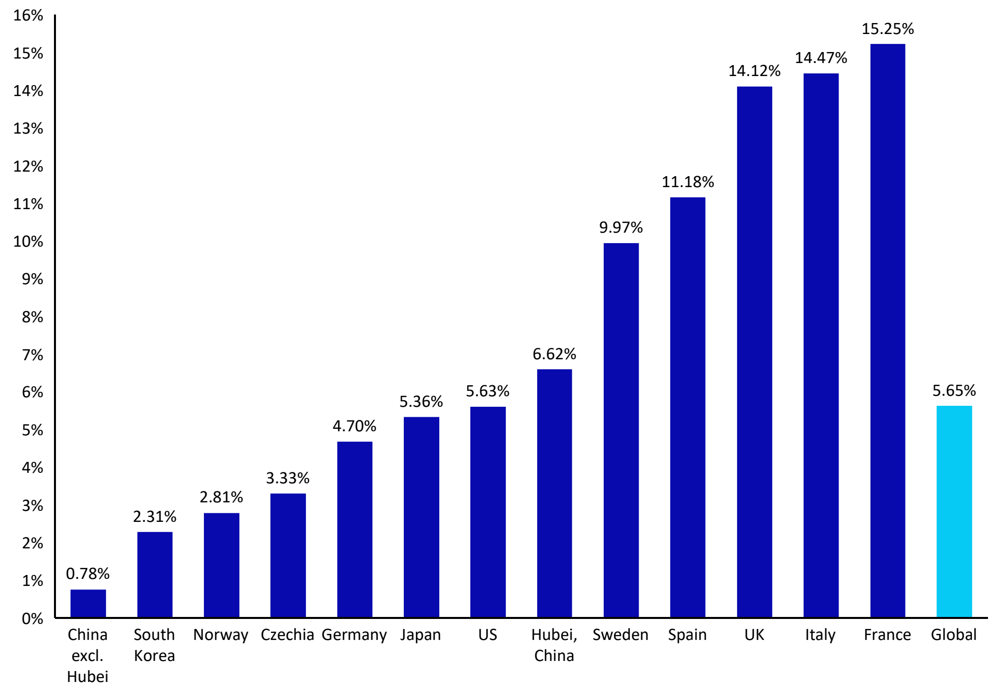
CASE FATALITY RATE (CFR) BY COUNTRY

While the global CFR is a useful metric to understand COVID-19, country-specific CFRs vary by an order of magnitude

CFR by country[1]



What is driving the variation?

- **Position along the trajectory of the outbreak:** For many countries (e.g. Europe, US), the vast majority of cases have not yet resolved and the CFR is changing rapidly
- **Breadth of testing:** Broader testing leads to a larger confirmed base of patients, decreasing CFR
- **Distribution of key risk factors within the population:** Age, gender and pre-existing conditions have a significant influence on mortality (see next page); countries with higher CFRs have a population skewed towards these risk factors (e.g. Italy has the second oldest population on earth)
- **Health system threshold:** Every country has a health system capacity, that when exceeded, will result in the inability to provide sufficient support to all patients thereby resulting in a higher CFR

Note that case fatality rates are still unstable as greater than 60% of cases outside of China are still active

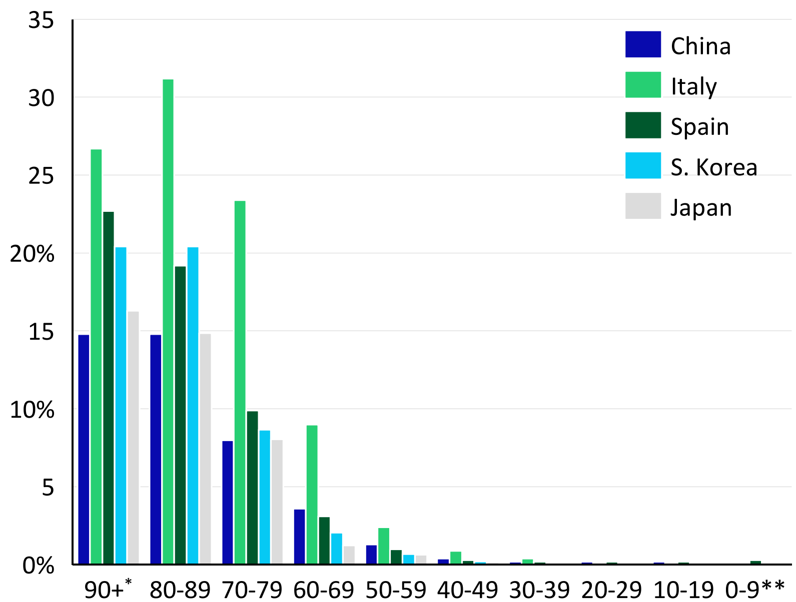
1. Calculated as Number of Deaths/Total Confirmed Cases as reported by Johns Hopkins University

CASE FATALITY RATE (CFR) BY PATIENT CHARACTERISTIC

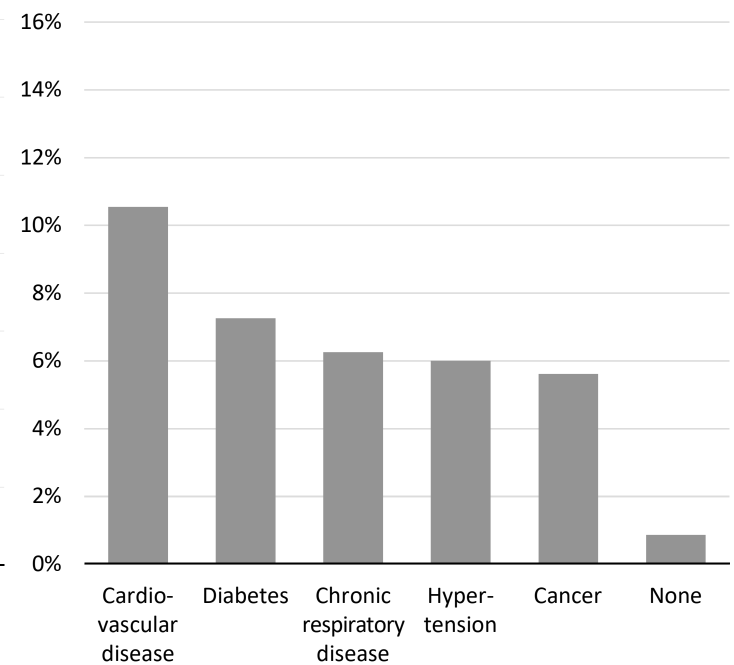
Significantly higher death rates occur among the elderly and those with underlying conditions

Case Fatality Rate by Specific Patient Characteristics

by Age[1,2,3]



by Comorbid Condition[1]



1. China data as of 02/11/2020 (link) 2. Italy data as of 04/08/2020 (link) 3. S. Korea data as of 04/08/2020 (link) 4. Spain data as of 04/08/2020 (link) 5. Japan data as of 04/06/2020 (link)

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MODELING CONSIDERATIONS

KEY ASSUMPTIONS TO DETERMINE RANGE OF PANDEMIC SCENARIOS

Estimating a range of infection and mortality rates is essential to determining the potential impact of COVID-19 given rapidly emerging data and a quickly changing situation

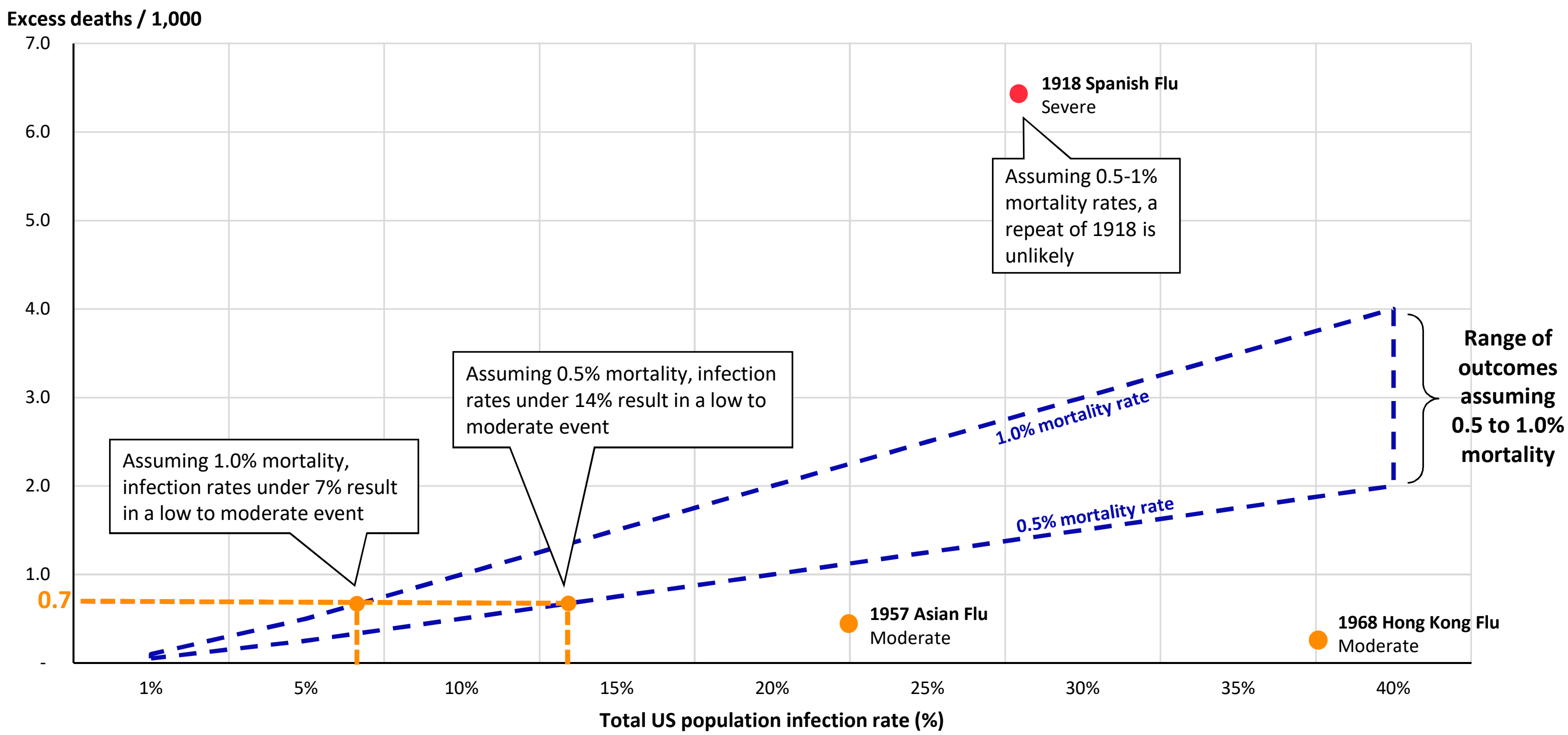
	Infection rate (% of population with disease)	Mortality rate (% of deaths in infected population)
COVID-19	• Wuhan, China (ground 0) infection rate: ~1% • Quarantine and social distancing measures are being implemented globally • Vaccines are being developed, but not expected to be available on a large scale for a year or more	• Mortality rate expected to be closer to 1% when proper healthcare can be provided • Rate increases significantly when healthcare system is overloaded, as seen in Italy (14.5% rate) • Virus-fighting drugs are in the process of being developed
Other pandemics	• Annual Flu infection rates range from ~3% to 16% • 1918 Spanish Flu infection rate was ~28% of the US population	• Annual Flu mortality rate range from 0.1% to 0.3% • 1918 Spanish Flu mortality rate was ~2.5% for the US population (higher globally)
Potential assumption ranges (US)	• Rate of 3 – 30%	• Base case: 0.5 – 1% • Stress: 2%+ if healthcare system overloaded
What to monitor	• Effectiveness of containment measures • When containment measures are lifted, and if subsequent outbreak waves occur • Pharmaceutical treatments	• Stability of healthcare system in “hot spots” • Amount of testing (also impacts reported infection rate)

Source: United States Department of Health and Human Services, Johns Hopkins University , as of April 26, 2020

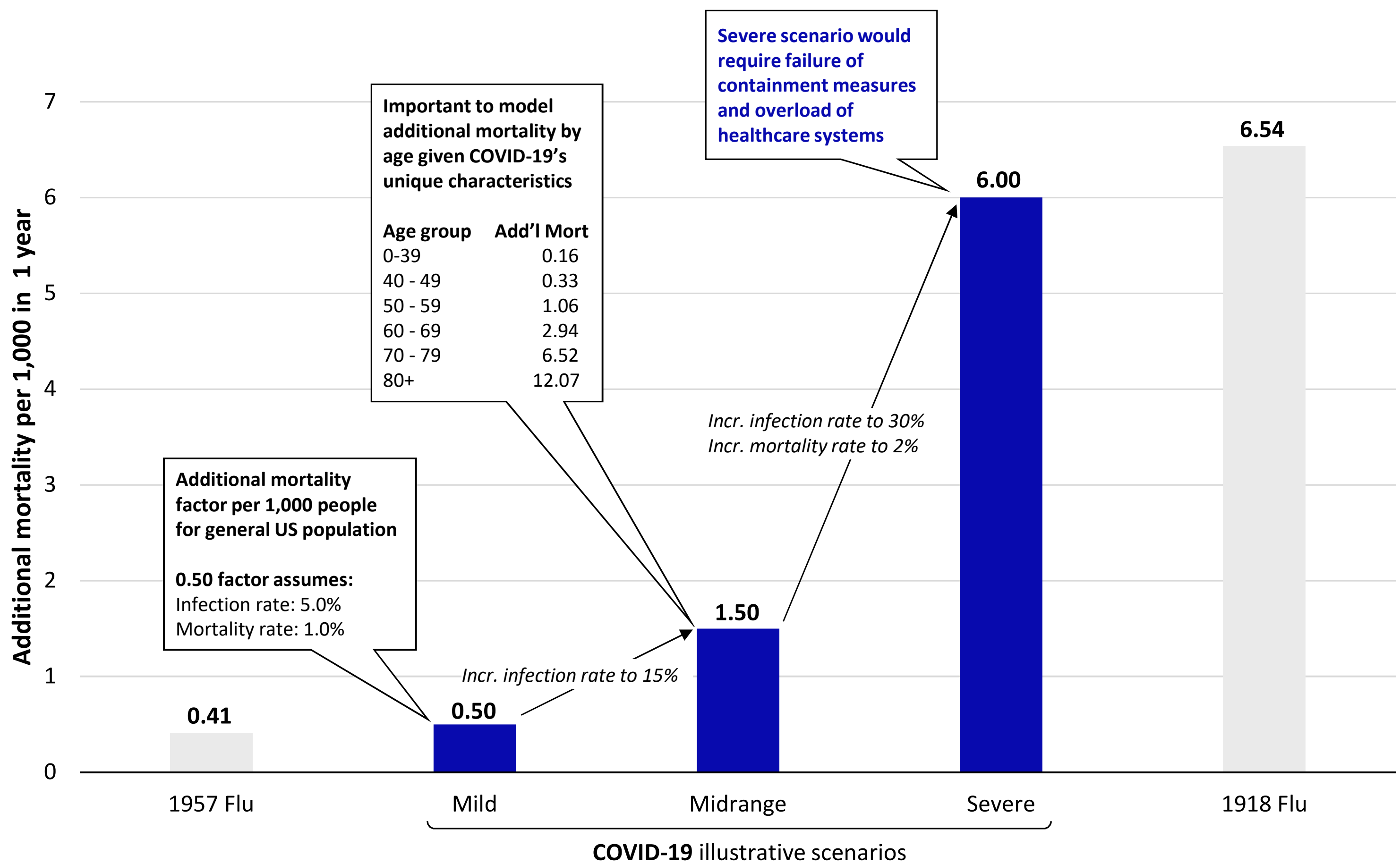
COVID-19 IS UNLIKELY TO REPEAT 1918 SPANISH FLU SCENARIO; HOWEVER, HIGHLY DEPENDENT ON HEALTHCARE SYSTEM STABILITY

Additional deaths per 1,000 people

Range of 1 year shocks in US; moderate pandemic scenario = 0.7 / 1,000 additional deaths in one year



COVID-19 ILLUSTRATIVE MORTALITY SCENARIOS

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Q&A

QUALIFICATIONS, ASSUMPTIONS AND LIMITING CONDITIONS