

# Data-Driven Strategies for COVID-19



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# About our project

**Topic:** Research about COVID-19 Pandemic

**Question:** What is the best data-driven strategy for the U.S to prevent the spread of COVID-19?

**Data sources:** John Hopkins University, Tomas Pueyo

**Article link:** TBD

# Algorithm for Calculating True Number of COVID-19 Cases

- The number of reported cases is not the actual number of cases
- We wanted a way to estimate the actual number
- Found a way using four variables:
  - 1. Number of current deaths**
  - 2. Mortality Rate**
  - 3. Days from Infection to Death (DID)**
  - 4. Doubling Rate**

<https://medium.com/@tomaspueyo/coronavirus-act-today-or-people-will-die-f4d3d9cd99ca>


[https://colab.research.google.com/drive/1Ki42LDTc\\_BdxlLe4Af2iT\\_-NLzbyRIP2#scrollTo=p75d6gn8cPsM](https://colab.research.google.com/drive/1Ki42LDTc_BdxlLe4Af2iT_-NLzbyRIP2#scrollTo=p75d6gn8cPsM)

```
# FUNCTION FOR CALCULATING TRUE AMOUNT OF COVID-19 CASES

# Fatality rate is assumed to be in percentage form

def calc_true_cases(current_deaths, fatality_rate, days_from_infection_to_death, doubling_time):
    past_num_cases = current_deaths / (fatality_rate/100)
    num_times_cases_doubled = days_from_infection_to_death/doubling_time
    true_num_cases = past_num_cases * 2**(num_times_cases_doubled)
    #print('Number of cases', days_from_infection_to_death , 'days ago:', past_num_cases,
          #'\nNumber of times cases have doubled:', num_times_cases_doubled,
          #'\nTrue number of cases today:', true_num_cases)
    return [past_num_cases, num_times_cases_doubled, true_num_cases]

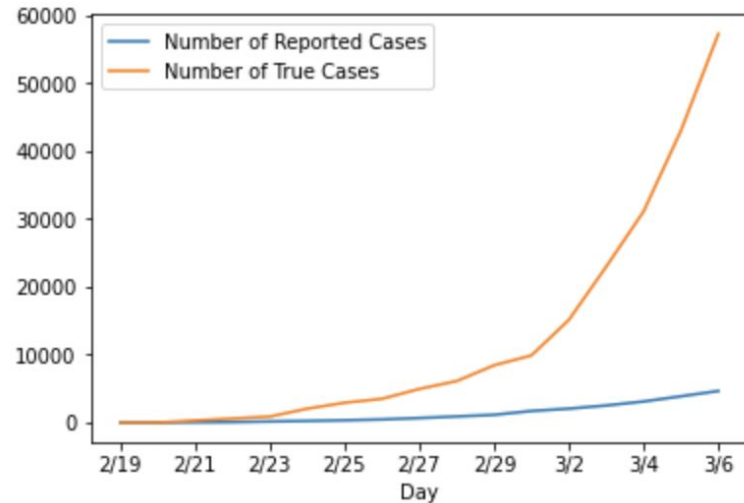
calc_true_cases(40, 5, 17, 5)
```

 [800.0, 3.4, 8444.850628946522]

True Cases = Past Cases \*  $2^{\text{Number of Times Case have Doubled}}$

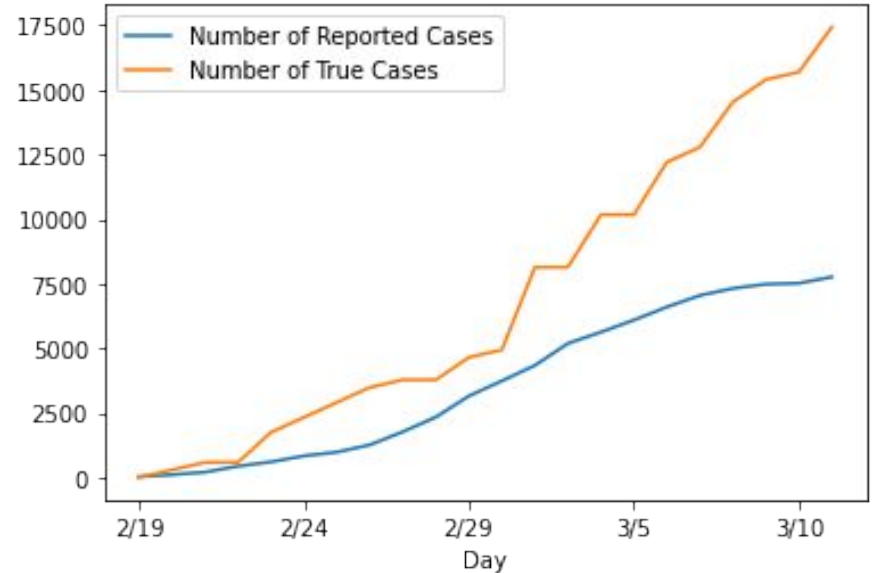
# Italy

- Serves as model of worst case scenario
- Problems via:
  1. Government indecision
  2. Slow Response
  3. Elder Population



# South Korea

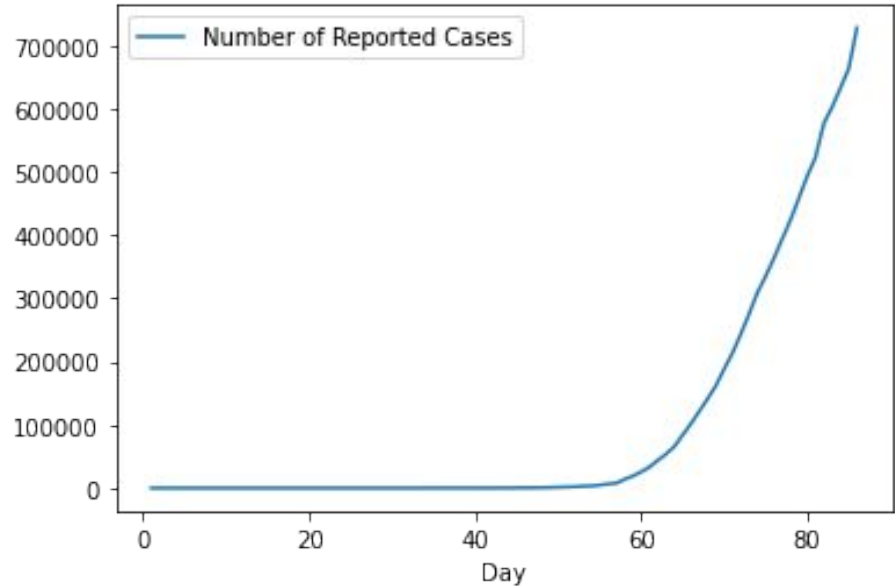
- Serves as model for how U.S should respond
- Succeeded via:
  1. Swift action
  2. Mass testing
  3. Contact Tracing
  4. Unified Gov/Citizen Effort



*Data courtesy of John Hopkins University*

# United States

- First U.S. Covid-19 Case @ Washington State: 1/20
- National emergency: 1/30
- Trump travel bans: 2/29
- **U.S. approve widespread testing: 3/3**
- C.D.C Gatherings: 3/15



## Interactive tool - Work in progress





	A	B	C
1			
2	Death Model Tool by Tomas Peuyo		
3			
4			
5			Inputs:
6	Total deaths as of today:		1
7	Fatality Rate:		0.025
8	Days from infection to death:		10
9	Doubling time:		5
10			
11			Outputs:
12	# of cases [ C8 ] days ago:		40
13	# of times cases have doubled:		2
14	True # of cases today:		160
15			

--> deaths divided by fatality rate [c6/c7]

--> Infectious time span divided by doubling rate [c8/c9]

--> original # of cases doubled k times [ c12 \* 2 ^ c13 ]

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Arbitrary numbers !

	<u>****TABLE 1****</u>				
stat:	Doubling Time	Avg Age	Hospital beds /million	<b>Mortality Rate</b>	
Northern Italy:					
South Korea:					
United States:					
	<u>****TABLE 2****</u>				
stat:	Tests /million	Gov't Influence	Societal Collaboration	<b>Doubling Rate</b>	
Northern Italy:					
South Korea:					
United States:					
	<u>****TABLE 3****</u>				
stat:				<b>Societal Collaboration</b>	
Northern Italy:					
South Korea:					
United States:					
	<u>****Table 4****</u>				
stat:	Swiftness	Breadth	Severity	Health spending / taxes	<b>Gov't Influence</b>
Northern Italy:					
South Korea:					
United States:					

Methodically obtained numbers !

(Hopefully less arbitrary)

# Mortality Rate

	<u>****TABLE 1****</u>				
stat:	Doubling Time	Avg Age	Hospital beds /million		<b>Mortality Rate</b>
Northern Italy:					
South Korea:					
United States:					

# Doubling Rate

	****TABLE 2****				
stat:	Tests /million	Gov't Influence	Societal Collaboration		<b>Doubling Rate</b>
Northern Italy:					
South Korea:					
United States:					

# Societal Collaboration

	<u>****TABLE 3****</u>					
stat:					<b>Societal Collaboration</b>	
Northern Italy:						
South Korea:						
United States:						

# Government Influence

	****Table 4****					
stat:	Swiftneesss	Breadth	Severity	Health spending / taxes		<b>Gov't Influence</b>
Northern Italy:						
South Korea:						
United States:						

## Difficulties

- Covid-19 is fast-evolving / are training data doesn't even completely exist yet
- Stats we used are speculative and weighted
- Existing data is somewhat unreliable/ incomplete



## Work in progress for Summer

- Finish interactive tool/widget to allow users to input features to predict the number of true cases in the U.S.
- Create a Machine Learning model that would allow us to predict future U.S. Covid-19 Cases
- Finish writing up the article

THANK YOU

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**Any Questions?**