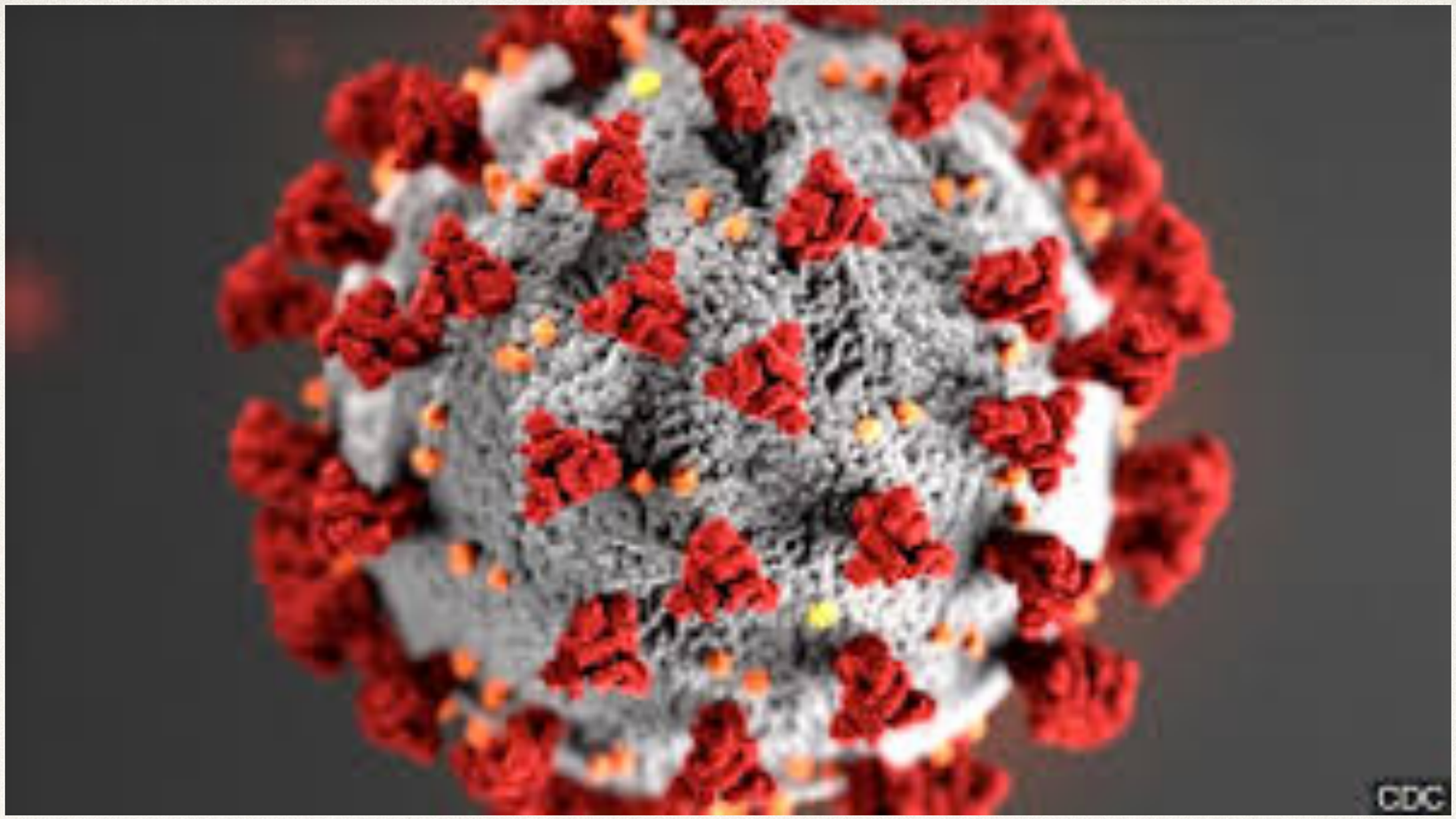


Prescreening COVID-19

Official Website (Not Available Yet): www.prescreencovid.org

Screening Software: https://dnahealthmap.shinyapps.io/CovidScreener_v01/

Pre-Release Website (Available Now): https://dnahealthmap.wixsite.com/prescreencovid19

03/18/2020

Problem

- US COVID-19 testing capacity is very limited
- The common cold resembles COVID-19 in phenotypic presentations in the early stage
  - A lot of low-risk people would get tested = wasting of critical COVID-19 testing resources
    - A lot of preventable fatalities from COVID-19 could be caused due to limited testing resources

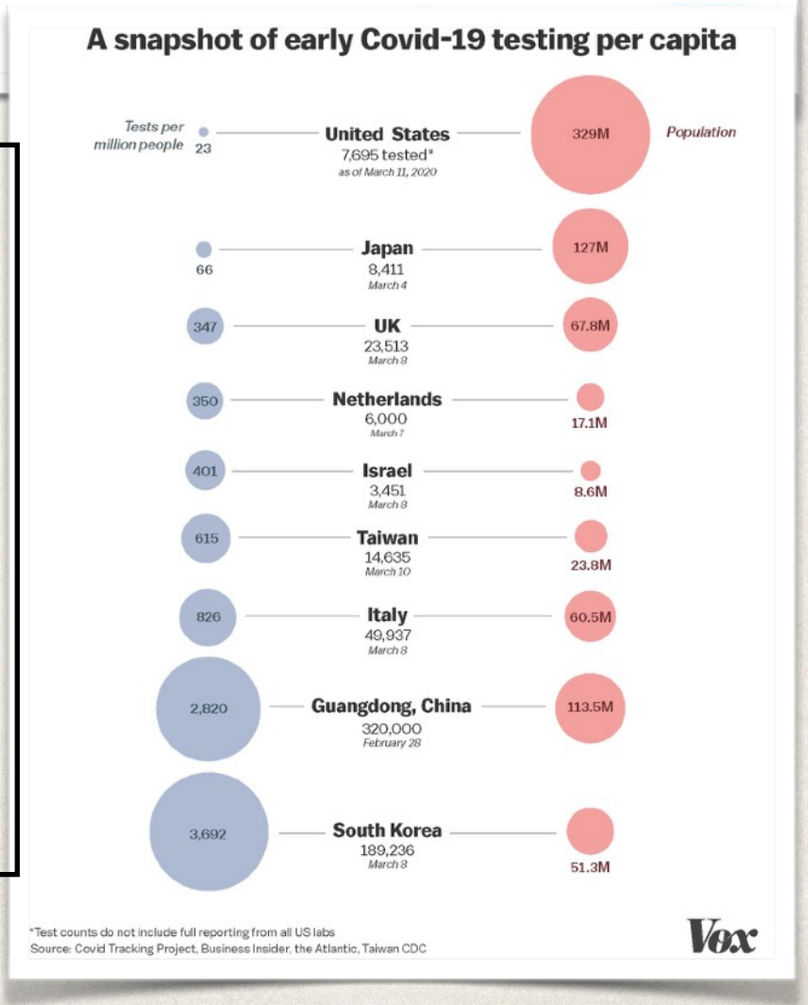
COVID-19 Testing Capacity

Organization	Testing Capacity (Total Patients)
Stanford University (CA)*	25
New York – Presbyterian Hospital (NY)	30
University of California, San Francisco (CA)	35
Northwell Health Labs (NY)	40
Johns Hopkins (MD)	50
Solaris Diagnostics (KY)	100
Centers for Disease Control and Prevention*	200
Bill & Melinda Gates Foundation	400
Viracor Eurofins (MO)	500
University of Washington Virology Lab	1,000
Quest Diagnostics*	1,000
LabCorp*	1,500
63 Public Health Labs Nationwide**	3,150
State of California (Private and Public Labs)	8,000
Total	**16,030**

* Based on preliminary estimates from publicly released documents.
** Based on an estimate of 100 specimen per day capacity per lab. Individual capacity varies across public health labs.

Information as of 3/11/2020: 1:00 p.m.

*Daily, 2 million Americans are suffering from the common cold



https://twitter.com/COVID2019tests/status/1237787311477264384/photo/1

https://www.vox.com/science-and-health/2020/3/12/21175034/coronavirus-covid-19-testing-usa

Solution

* Release a web page & an app of prescreening COVID-19
* Inform the public when to see a doctor for the COVID-19 testing

10 **COVID-19 Positive Symptoms**

Major Symptoms (Over 25% of COVID-19 Patients Experience)
-Fever
-Dry Cough
-Fatigue
-No Appetite
-Sputum
-Muscle or Bone Pain

Minor Symptoms (Under 25% of COVID-19 Patients Experience)
-Sore Throat
-Chills
-Headache or Dizziness
-Nausea or Vomiting

4 **Life-threatening Emergency Complication Indicators**

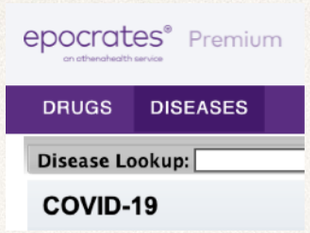
-Difficulty breathing
-Chest pain or pressure
-Bluish lips or face
-Confusion

2 **Risk Adjusting Factor**

-Age
-Chronic disease (hypertension, respiratory disease, heart disease, diabetes, or immunocompromised)

How is the Criteria Chosen?

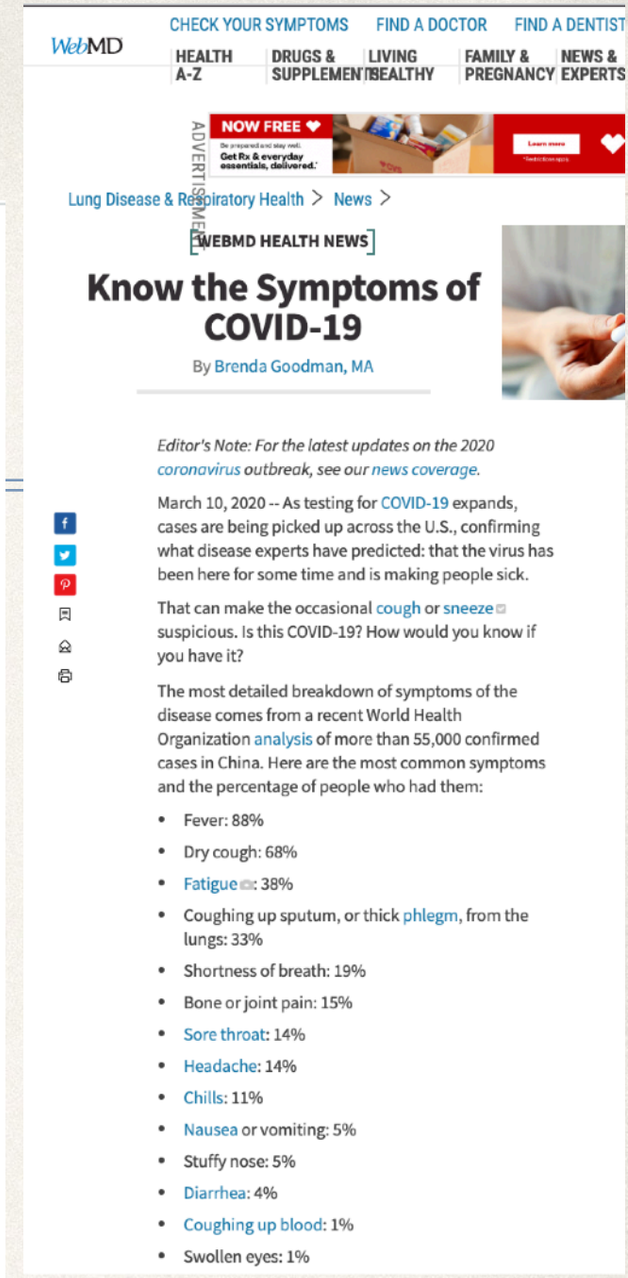
- All from Epocrates except "Chills" (WebMD)
- UpToDate was just referenced



Factor	Frequency
fever	common
• Reported in 83% to 98% of patients in case series. [6] [7] [8] [70] [71] In one case series, 44% of patients had a fever on presentation, but it developed in 89% of patients after hospitalization. [9]	
• Children may not present with fever, or may have a brief and rapidly resolving fever. [11] [74]	
• Patients may present with chills/rigors.	
• The course of fever is not fully understood yet, but it may be prolonged and intermittent.	
cough	common
• Reported in 59% to 82% of patients in case series. [6] [7] [8] [9] [70] [71]	
• Cough is usually dry.	
dyspnea	common
• Reported in 18% to 55% of patients in case series. [6] [7] [8] [9] [71]	
• Median time from onset of symptoms to development of dyspnea is 5 to 8 days. [6] [7] [8]	

Other Diagnostic Factors

Factor	Frequency
fatigue	common
• Reported in 35% to 69% of patients in case series. [6] [8] [9] [71]	
• Patients may also report malaise.	
myalgia	common
• Reported in 11% to 44% of patients in case series. [6] [7] [8] [9] [70]	
anorexia	common
• Reported in 40% of patients in case series. [8]	
sputum production/expectoration	common
• Reported in 26% to 33% of patients in case series. [6] [8] [9]	
sore throat	common
• Reported in 5% to 17% of patients in case series, and usually presents early in the clinical course. [7] [8] [9]	
confusion	uncommon
• Reported in 9% of patients in case series. [7]	
dizziness	uncommon
• Reported in 9% to 12% of patients in case series. [8] [71]	



UpToDate®

In a study describing 138 patients with COVID-19 pneumonia in Wuhan, the most common clinical features at the onset of illness were [39]:

- Fever in 99 percent
- Fatigue in 70 percent
- Dry cough in 59 percent
- Anorexia in 40 percent
- Myalgias in 35 percent
- Dyspnea in 31 percent
- Sputum production in 27 percent

What's the Weight of Each Criteria?

10 **COVID-19 Positive Symptoms (Total: 352.5)(Average: 35.3)**

6 Major Symptoms
(Major Symptoms Total: 311.5,
Major Symptoms Average:51.9)
-Fever: 90.5 (average of 83 & 98)
-Dry cough: 70.5 (average of 59 & 82)
-Fatigue: 53.5 (average of 35 & 69)
-No appetite: 40
-Sputum: 29.5 (average of 26 & 33)
-Muscle or Bone Pain: 27.5 (average of 11 & 44)

4 Minor Symptoms
(Minor Symptoms Total: 41
Minor Symptoms Average: 10.3)
-Sore Throat: 11
-Chills: 11
-Headache or Dizziness: 10
-Nausea or Vomiting: 9

4 **Life-threatening Emergency Complication Indicators (Total: 435, Average: 108.8)**
-Difficulty breathing: 135
-Chest pain or pressure or irregular heart beat: 100
-Bluish lips or face: 100
-Confusion: 100

2 **Risk Adjusting Factor (Total: 103.8, Average: 51.9)**
-Age (<60yo:0, >60yo: 51.9)
-Chronic disease (hypertension, respiratory disease, heart disease, diabetes, or immunocompromised) (no:0, Yes: 51.9)

- Total: 891.3

No:0, Yes:1

Calculations of the Recommendations

-Subject to change-

No:0, Yes:1

Recommendation Category	Minimum Standard	Score
Doctor Consultation for COVID-19 Testing Recommended:	Fever + Dry cough + 60 yo or more (212.9)	> 212

- Highest Score Total= 891.3

Calculations of the Recommendations

-Subject to change-

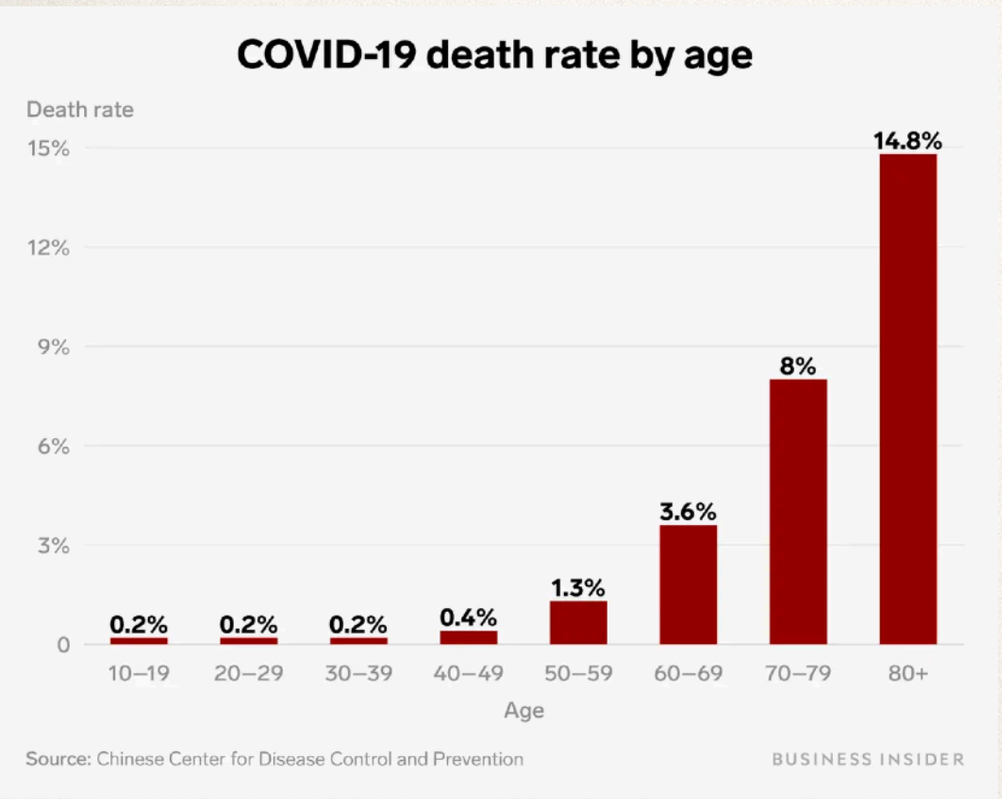
No:0, Yes:1

Recommendation Category	Minimum Standard	Score
Fast-Track COVID-19 Testing Recommended:	+3 Major Symptoms Yes (3*51.9*1) + 1 Emergency Indication Yes (1*108.8*1) + 1 Age or Chronic Disease Factor Yes (1*51.9*1)	> 316.4
COVID-19 Testing Recommended:	Fever + Dry Cough + 1 Emergency Indication (261 or 296)	> 260
Doctor Consultation for COVID-19 Recommended:	Fever + Dry cough + 60 yo or more (212.9)	> 212
Continued Monitoring Recommended until Further Symptoms Develop	N/A	0 - 211.9

- Highest Score Total= 891.3

Age

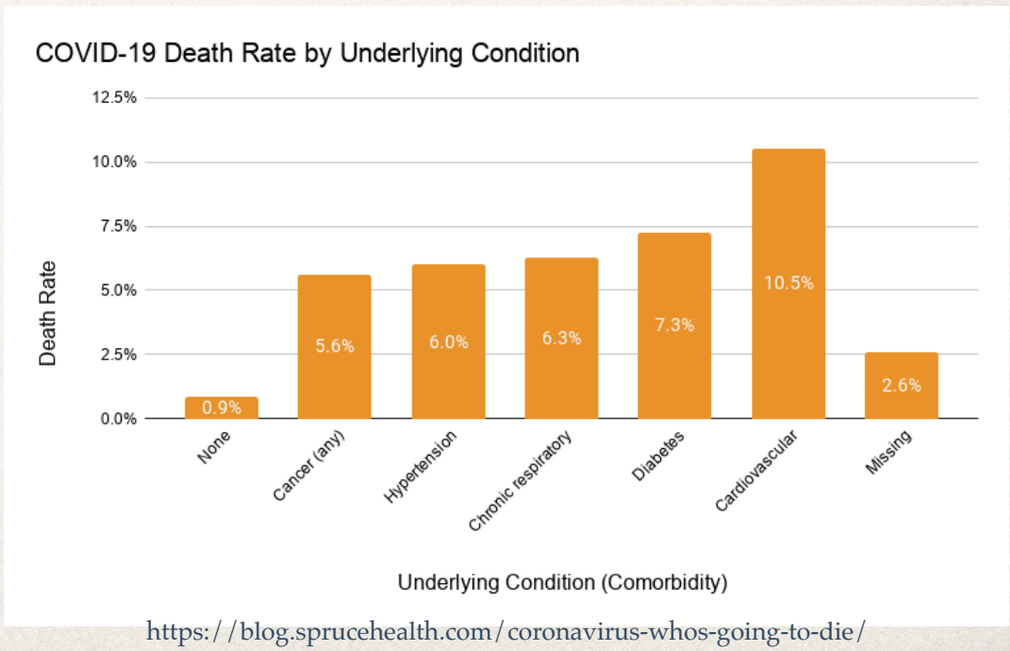
- <60 yo: 0
- >60 yo: 51.9



https://www.businessinsider.com/coronavirus-death-rate-by-age-countries-2020-3#like-other-viruses-covid-19-doesnt-affect-all-patients-equally-2

Chronic Disease (Comorbidity)

- no: 0
- hypertension, respiratory disease, heart disease, diabetes, or immune-compromised: 51.9



https://blog.sprucehealth.com/coronavirus-whos-going-to-die/

Fever (Temperature)

- Fever > 37.8 C (100 F) in armfit or forehead

September 23, 1992

A Critical Appraisal of 98.6°F, the Upper Limit of the Normal Body Temperature, and Other Legacies of Carl Reinhold August Wunderlich

Philip A. Mackowiak, MD; Steven S. Wasserman, PhD; Myron M. Levine, MD

» Author Affiliations

JAMA. 1992;268(12):1578-1580. doi:10.1001/jama.1992.03490120092034

Conclusions. —Thirty-seven degrees centigrade (98.6°F) should be abandoned as a concept relevant to clinical thermometry; 37.2°C (98.9°F) in the early morning and 37.7°C (99.9°F) overall should be regarded as the upper limit of the normal oral temperature range in healthy adults aged 40 years or younger, and several of Wunderlich's other cherished dictums should be revised.(*JAMA*. 1992;268:1578-1580)

The NEW ENGLAND JOURNAL of MEDICINE

Clinical Characteristics of Coronavirus Disease 2019 in China

Wei-jie Guan, Ph.D., Zheng-yi Ni, M.D., Yu Hu, M.D., Wen-hua Liang, Ph.D., Chun-quan Ou, Ph.D., Jian-xing He, M.D., Lei Liu, M.D., Hong Shan, M.D., Chun-liang Lei, M.D., David S.C. Hui, M.D., Bin Du, M.D., Lan-juan Li, M.D., et al., for the China Medical Treatment Expert Group for Covid-19*

Fever was defined as an axillary temperature of 37.5°C or higher.

- **Axillary thermometry** – Axillary temperature is consistently lower than rectal temperature, but the absolute difference varies too widely for a standard conversion [7]. Axillary temperatures may be measured in neutropenic patients who are unable to use an oral thermometer.

- **Infrared thermometry** – Infrared TM thermometers measure the amount of heat produced by the TM. Temperature readings are close to core temperature, although the infrared TM reflective devices commonly used in homes, hospitals, and offices are considerably less accurate than TM thermistors used in research and by anesthesiologists [3,8-16]. Individual studies comparing TM and rectal temperatures in children have had contradictory results.

Other cohort studies of patients from Wuhan with confirmed COVID-19 have reported a similar range of clinical findings [38,40,56,57]. However, fever might not be a universal finding. In one study, fever was reported in almost all patients, but approximately 20 percent had a very low grade fever <100.4°F/38°C [38]. In another study of 1099 patients from Wuhan and other areas in China, fever (defined as an axillary temperature over 99.5°F/37.5°C) was present in only 44 percent on admission but was ultimately noted in 89 percent during the hospitalization [34].

Benefits of Prescreencovid Tool (Web Platform & App)

- By delaying the testing of low-risk common cold patients, more of the high-risk patients have access to testing & more lives could be saved

Risks of Prescreencovid Tool (Web Platform & App)

- It is challenging to identify exactly the right time to get tested or consult with a doctor

- Early diagnosis of COVID-19 patients could be delayed as the patients need to wait until additional symptoms appear

www.prescreencovid.org

Plan

Wed, 03/18/2020 — **Preliminary Work**
Get ready

Thu, 03/19/2020 — **1st Validation**
Get 10 physicians' endorsement

Thu, 03/19/2020 — **Consult with Lawyers**
Check Regulations

Fri, 03/20/2020 — **Finalize App & Web Platform**
Set up the www.prescreencovid.org site

Sat, 03/21/2020 — **Release to Public**
Disseminate it to people

Fri, 03/27/2020 — **2nd Validation**
Get endorsements from 10 more physicians who treated COVID-19 patients

What We Are Looking For

- 10 volunteer physicians to review the prescreening algorithm, provide important feedback, and officially endorse this by agreeing to list their names on the website at “www.prescreencovid.org"

- My promise to those volunteering physicians: We are focused on **helping people & saving lives**. It will **not** be used for **commercial purposes**.

Contact

Contact: Sajung Yun, PhD (syun15@jhmi.edu) - Adjunct faculty at Johns Hopkins University, currently teaching Tools for Genome Analysis course at the graduate school.

Web version is developed by Sijung Yun, PhD (National Institutes of Health researcher)

App version is developed by Sajung Yun, PhD (Hopkins Adjunct Faculty)