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Mapping the Risk of Possible Severe COVID-19 Cases in Harris County

With evidence of community transmission, we enter a new phase in the COVID-19 pandemic in the US, prompting more extensive government action and more restrictive social controls. In this phase, the attention of public health authorities expands from preventing COVID-19 to slowing its spread. This shift from containment to mitigation means that personal protective actions and travel restrictions alone are no longer adequate to stop the rapid increase in new cases. The question becomes whether the increase can be slowed down, and new cases spread over a longer time interval so that our health care system can meet their needs. The social distancing measures governments are putting in place world-wide are intended to ensure that medical care systems are not overwhelmed with severe cases in need of hospitalization. Current projections are that from 40 to 60% of the population will eventually have the novel corona virus, the crucial issue is when.
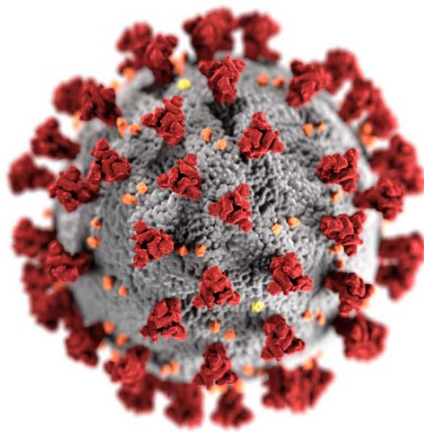
Coronavirus

Source: US Centers for Disease Control and Prevention, 2020

Scientific understanding of the population health impacts of the virus is still evolving. We do know from data on Hubei Province[1], that just over 80% of those infected will recover fully on their own. The troubling fact is that the adverse effects on the remaining 20% will be severe enough to require hospitalization. About a third of those severe cases who have been hospitalized will require critical care, including ventilator and invasive life supports. Once the need for these measures exceeds the capacity of the local hospital system to provide them, the mortality rate is likely to increase. In short, as the rate of new infections increases, expanding current capacity for hospitalization becomes essential for saving lives.

The data on hospitalizations throughout China provided our first glimpse of the composition of the patient population with severe enough symptoms to require hospital-based care. The two common characteristics were age 60 and older or one or more pre-existing chronic diseases. The Centers for Disease Control and Prevention has identified these as risk factors for severe disease among those with COVID-19[2].

To ensure that our capacity for hospitalization can meet the needs of those likely to be severely ill from COVID-19, we have constructed a map of Harris County showing the distribution of residents with risk factors for severe illness. At present, we are at the "suppression" phase[3] when testing of potential cases, isolation and contact tracing helps to identify clusters of infections and slow its speed. For this phase to be successful, we will need a lot of testing[4], which is currently lacking. If infections are widespread, it is important to plan-ahead for the needed capacity. As we will show, the risk of severe disease is not uniformly distributed across the county. The data for this analysis is drawn from the 2018 Health of Houston Survey, a stratified random-sample survey of 5,700 households and uses self-report of medical diagnosis to indicate presence of chronic disease.

MAP 1. Risk of Potential Severe Cases
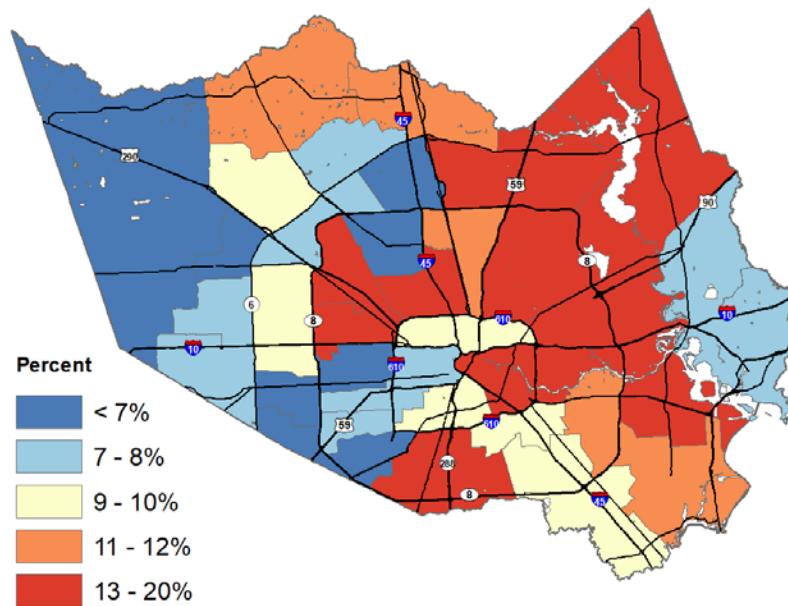
Source: 2018 Health of Houston Survey 2018

Map 1 shows the Risk of Severe Cases across the 38 US Census Bureau's public use microdata areas (PUMAs). Those areas with the highest relative percentages of residents with 3 or more of the listed risk factors are shown in red.

Risk Factors for Severity

-Age 60 and older

-Current asthma diagnosis

-COPD diagnosis

-Stroke diagnosis

-Heart disease diagnosis

-Myocardial Infarction diagnosis

-Hypertension diagnosis

-Diabetes diagnosis

The areas shown in red (Map 1)
(Three or more factors)

East Little York - Settegast
Deer Park - Channelview
South Acres Home - Northline
Central Southwest - COH Fort Bend
Humble Atascosita
Galena Park - Jacinto City
Spring Valley - COH West
Kingwood - Lake Houston
Carverdale - Fairbanks/NW Crossing

Not all of these chronic conditions appear in people 60 and older. The following table compares the number of chronic conditions by whether residents are below 60 or 60 and older.
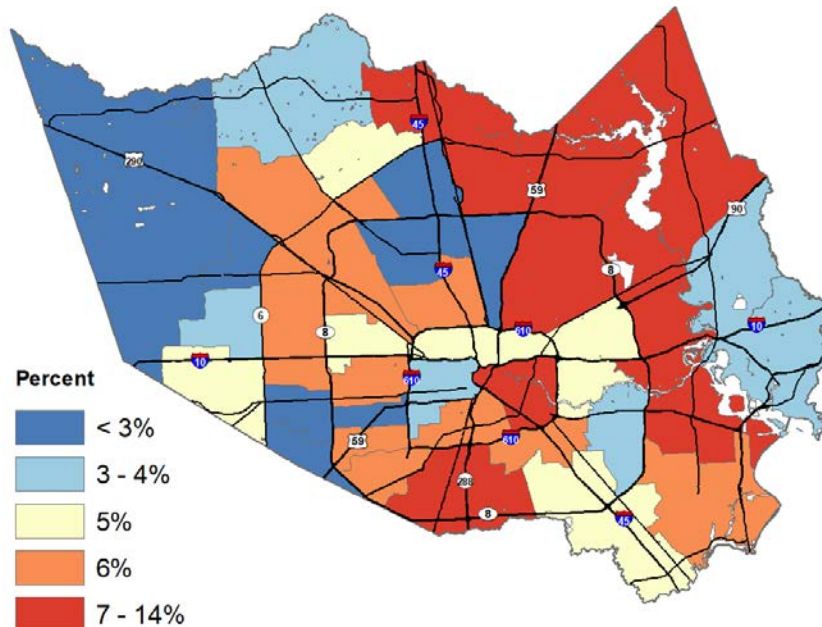
Table 1. Chronic Conditions by Age

Number of Risk Factors*	Less than 60 years (%)	60 years and over (%)	Total (%)
0	68.7	25.4	60.3
1	22.5	34.2	24.7
2	6.2	23.0	9.4
3	1.6	10.4	3.3
4	0.5	4.7	1.4
5	0.2	1.8	0.5
6	0.1	0.3	0.2
7	0.2	0.2	0.2

*Age is not included

To consider the critical cases -- those most likely to require intensive care -- among residents with risk of severe disease, we constructed another map that shows only those 65 or older and the reported presence of one or more of three conditions: Chronic Obstructive Pulmonary Disease (COPD), Heart Disease and Diabetes. Again, the areas with the highest percentages of residents at risk of critical disease appear in red.

MAP 2. Risk of Potential Critical Cases

Percent
- < 3%
- 3 - 4%
- 5%
- 6%
- 7 - 14%

Source: 2018 Health of Houston Survey

The areas shown in red (Map 2)
(65 year or older plus 1-3 risk factors)

Deer Park - Channelview
East Little York - Settegast
Humble Atascocita
Central Southwest - COH Fort Bend
Spring - The Woodlands
Downtown - East End
Kingwood - Lake Houston

Risk Factors for Critical Outcomes

-Age 65 and older
-COPD diagnosis
-Heart disease diagnosis
-Diabetes diagnosis

The most recent compilation of US cases, reported on March 18 by the CDC[5], notes a similar pattern, connecting the severity of illness with age. Note that the CDC data are missing characteristics such as hospitalization status, ICU admission, case outcome, and age on 53% of their reported cases, and have no information on underlying conditions for any of these cases. While 31% of the confirmed cases occurred in people 65 or older, this group made up 45% of the severe cases requiring hospitalization, 53% of those needing intensive care, and 80% of the deaths. The US data also indicate, however, that severe cases are not limited to those 65 and older. Table 2 shows the percentage of persons hospitalized within each age range.

Table 2. Distribution of COVID-19 cases, hospitalizations, ICU admissions and deaths in US by age groups

Cases with COVID-19 with known age (n=2,449)

Age	0-19	20-44	45-54	55-64	65-84	85 & over
	5%	29%	18%	18%	25%	6%

Known Hospital Admissions from COVID-19 (n=508)

Age	0-19	20-44	45-54	55-64	65-84	85 & over
	<1%	20%	18%	17%	36%	9%

Known ICU Admission from COVID-19 (n=121)

Age	0-19	20-44	45-64	65-84	85 & over
	0%	12%	36%	46%	7%

Known Deaths from COVID-19 (n=44)

Age	0-19	20-64	65-84	85 & over
	0%	20%	46%	34%

Note: Data taken from CDC COVID-19 Response Team. Severe outcomes among patients with coronavirus disease 2019 (COVID-19) - United States, MMWR. February 12-March 16, 2020. March 18, 2020; Vol.69

Please note that these disease-related risk factors do not necessarily reflect the adverse economic impact of COVID-19 on the population. As measures to halt the spread of the disease severely impact the local economy, social and economic disadvantages are likely to grow. We have noted before, these disadvantages and the social vulnerabilities they create are not uniformly distributed across the county and will continue to reinforce other health disparities and limit access to health care.

References

[1]Wei-jie Guan, Zheng-yi Ni, Yu Hu, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *New England Journal of Medicine*. February 28, 2020.

[2]US Centers for Disease Control and Prevention. Implementation of Mitigation Strategies for Communities with Local COVID-19 Transmission. CS 315926-A, 03/12/2020. Accessed on March 17, 2020. Available at: https://www.cdc.gov/coronavirus/2019-ncov/downloads/community-mitigation-strategy.pdf.

[3]NPR. Coronavirus: U.S. Urges Americans To Home-School; The WHO Says: ′Test, Test, Test′. March 16, 2020. Accessed on March 17, 2020. Available at: https://www.npr.org/sections/health-shots/2020/03/16/816428320/coronavirus-u-s-enters-quarantine-life-as-many-schools-and-businesses-close.

[4]John M. Barry The Single Most Important Lesson From the 1918 Influenza. New York Times. Opinion. Accessed on March 17, 2020. Available at: https://www.nytimes.com/2020/03/17/opinion/coronavirus-1918-spanish-flu.html.

[5]Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020. MMWR Morb Mortal Wkly Rep. ePub: 18 March 2020. DOI: http://dx.doi.org/10.15585/mmwr.mm6912e2.

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