

May 14, 2020

## Update on Risk Factors for Severe COVID-19 in Cities and Neighborhoods across the Houston Area

In our earlier Houston work, we mapped the set of eight risk factors for severe infection that were reported<sup>1</sup> among the hospitalized COVID-19 cases in Wuhan. By the end of March, the Centers for Disease Control and Prevention had adapted its flu surveillance system in 14 states to reporting on risk factors for the US. The set of key underlying chronic conditions, seen as risk factors accounting for most hospitalizations (approximately 89%), were narrowed to three chronic conditions—hypertension, obesity, and metabolic disorders (including diabetes) for those under age 65, and cardiovascular disease replacing obesity for those over 65. About half of the hospitalized people had high blood pressure and obesity, one third had diabetes, and one third had cardiovascular disease.<sup>2</sup> Advancing age continues to be a risk factor, especially for fatalities among the hospitalized. This update identifies the neighborhoods where these four risk factors (plus age over 65) are concentrated and represent areas with the highest likelihood of the most severe cases of COVID-19.

Throughout April, news reports documented high risks of exposure in enclosed and crowded spaces – notably, prisons and long-term care facilities. Nursing home residents in Washington State were among the first COVID-19 cases in the US. Recent data for Texas, compiled by the Kaiser Family Foundation,<sup>3</sup> indicates how the combination of advanced age and underlying conditions with residence in a long-term care setting has proven lethal with the spread of coronavirus. As of May 7, COVID-19 fatalities among these residents accounted for 41% of the state's total. We do not yet have detailed data on these fatalities. The data we report below does not include residents of long-term care facilities.

Another of the recently documented features of the population-level impact of COVID-19 has been the disproportionate numbers of African Americans among both diagnosed cases and fatalities. In other areas, Hispanic residents have been disproportionately affected.<sup>4</sup> A recent observational study<sup>5</sup> conducted by Methodist Foundation with data from patients accessing Houston Methodist Hospital in the Greater Houston Area, showed that African American residents had a higher risk of infection compared to White residents, as well as Hispanic residents compared to non-Hispanic population. The higher risk among African Americans persisted even after controlling for other relevant factors such as median household income, population density, and comorbidities. We will include both Black race and Hispanic ethnicity to identify neighborhoods among those at highest risk of severe COVID-19.

Additionally, a study<sup>6</sup> released last week of cases and fatalities recorded by the National Health Service in England and Wales, noted that both race (in this instance, black) and poverty had an independent effect on COVID-19 risk and severity. Accordingly, we update our earlier mapping to include poverty as well as race and ethnicity.

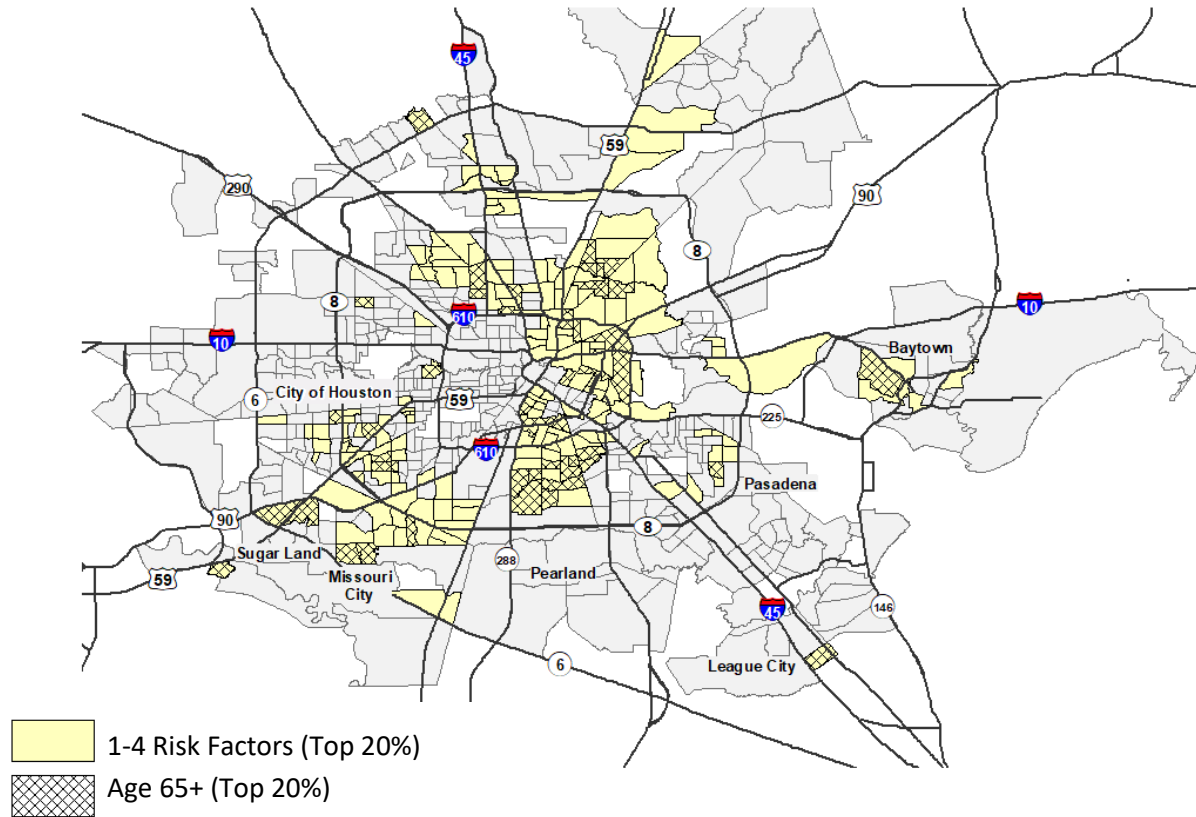
There are 11 maps in this updated collection and the study region, defined as ‘Greater Houston area’, includes cities of Houston, Pasadena, Pearland, Sugar Land, Missouri City, League City, and Baytown. The principal three maps depict census tracts that rank in the top 20% of all tracts in the Greater Houston area in prevalence of one or more of the four risk factors for severe COVID-19 disease, along with high concentration of vulnerable populations, such as African American residents, Hispanics and people 65 years or older.

Our selection of areas with the highest rates of chronic disease, social and economic vulnerability, is determined and informed by the need to highlight the increased relative risk they have compared to other neighboring areas. This does not mean that communities of other areas will not be impacted by severe cases of COVID-19, but that the impact, based on the factors we explore, will be relatively lower compared to the tracts we highlight. Our selection of high-risk areas is also useful in the mitigation phase, while we reopen our economies and more testing and contact tracing is implemented. If contact tracing identifies hot spots of infection in high-risk areas, the mitigation efforts from the local governmental agencies, community organizations, and health care providers in these areas could be more aggressive and strategically different compared to other areas.

The remaining eight maps, found in Appendix A, provide much greater detail at the neighborhood level for those areas where all of these factors – the four underlying medical conditions, African-American race, Hispanic ethnicity and poverty -- are present. They cover the four quadrants of the region with enough detail to identify neighborhoods affected at the highest risk levels. The full distribution of COVID-19 chronic risk factors across Greater Houston area are shown in Appendix B.

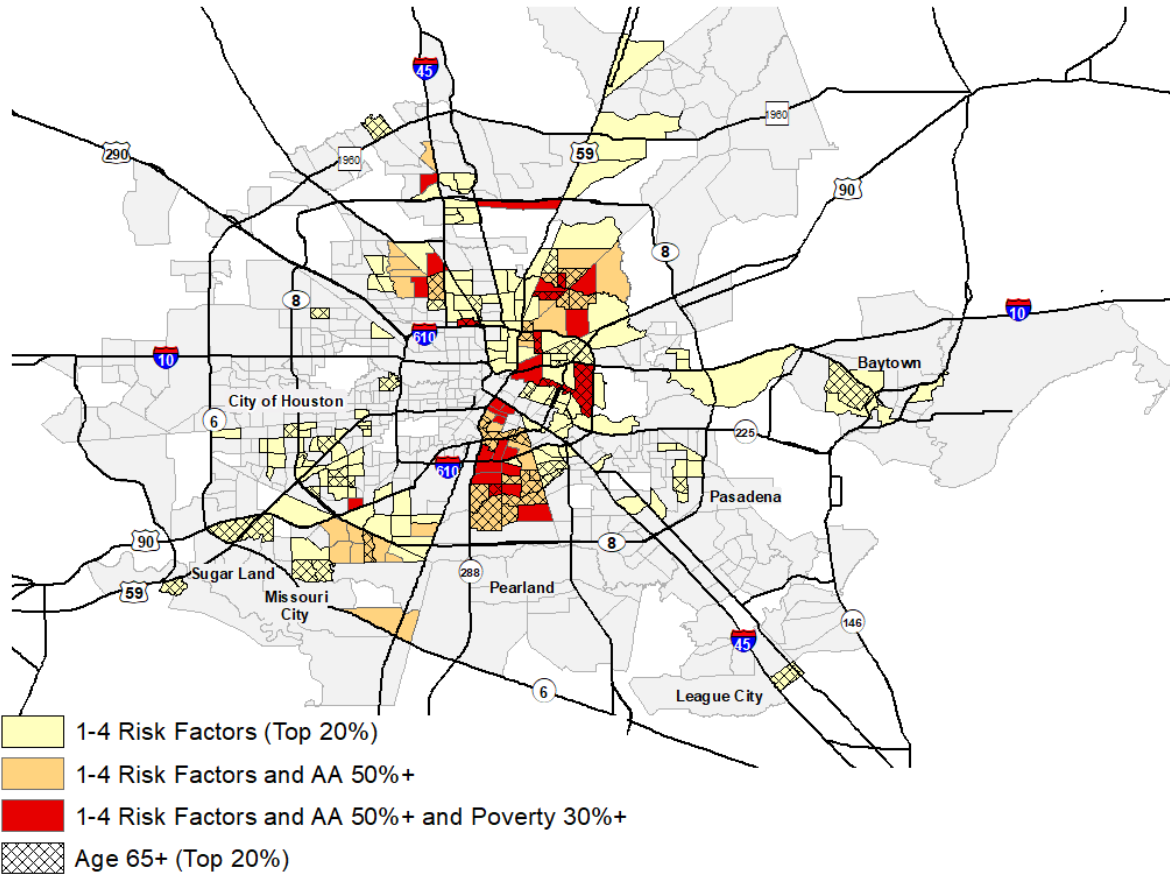
The data for these maps were obtained from federal sources. Census tract rates of chronic disease identified as risk factors for COVID-19 (coronary heart disease, hypertension, obesity and diabetes) are drawn from the CDC’s 500 Cities Project, which provides small area estimates based on 2017 Behavioral Risk Factor Surveillance System (BRFSS)<sup>7</sup>. Obesity is defined as a body mass index (BMI)  $\geq 30.0$  kg/m<sup>2</sup>, calculated from self-reported adults’ weight and height. US Census Bureau’s American Community Survey 5-year Summary (2014-2018) served as the source for socio-demographics, such as race, ethnicity, age and income at or below the federal poverty level (FPL).

Map 1. Census Tracts with Highest Rates of Chronic Conditions Associated with COVID-19 Severity



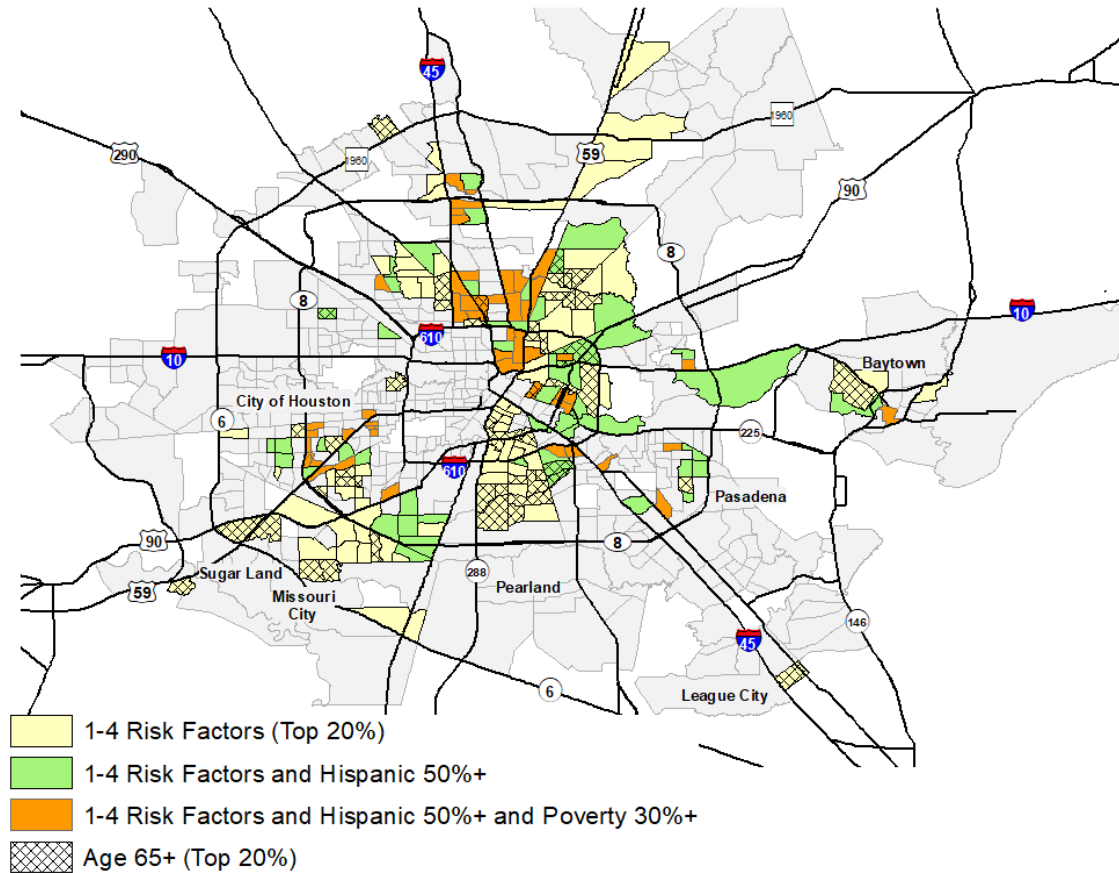
Map 1 depicts distribution of census tracts that are among the top 20% in one or more of the four chronic diseases that CDC recognizes as currently the most prevalent risk factors for severe COVID-19, specifically, hypertension, coronary heart disease, diabetes mellitus, and obesity. This designation of tracts with the highest rates of chronic risk factors becomes the base upon which we will present layers of social, demographic and economic vulnerability to COVID-19. We start with the population aged 65 and older, which has been identified as the age group where the mortality rate from COVID-19 infection and complications is higher compared to younger ages. Tracts with chronic disease risk, and where a high percentage of population aged 65 years or older (14.5-39%) resides, are shown with cross-hatching.

Map 2. Census Tracts with Highest Rates of Chronic Risk Factors for COVID-19 Severity, Majority of African-American Residents and Highest Concentration of Poverty



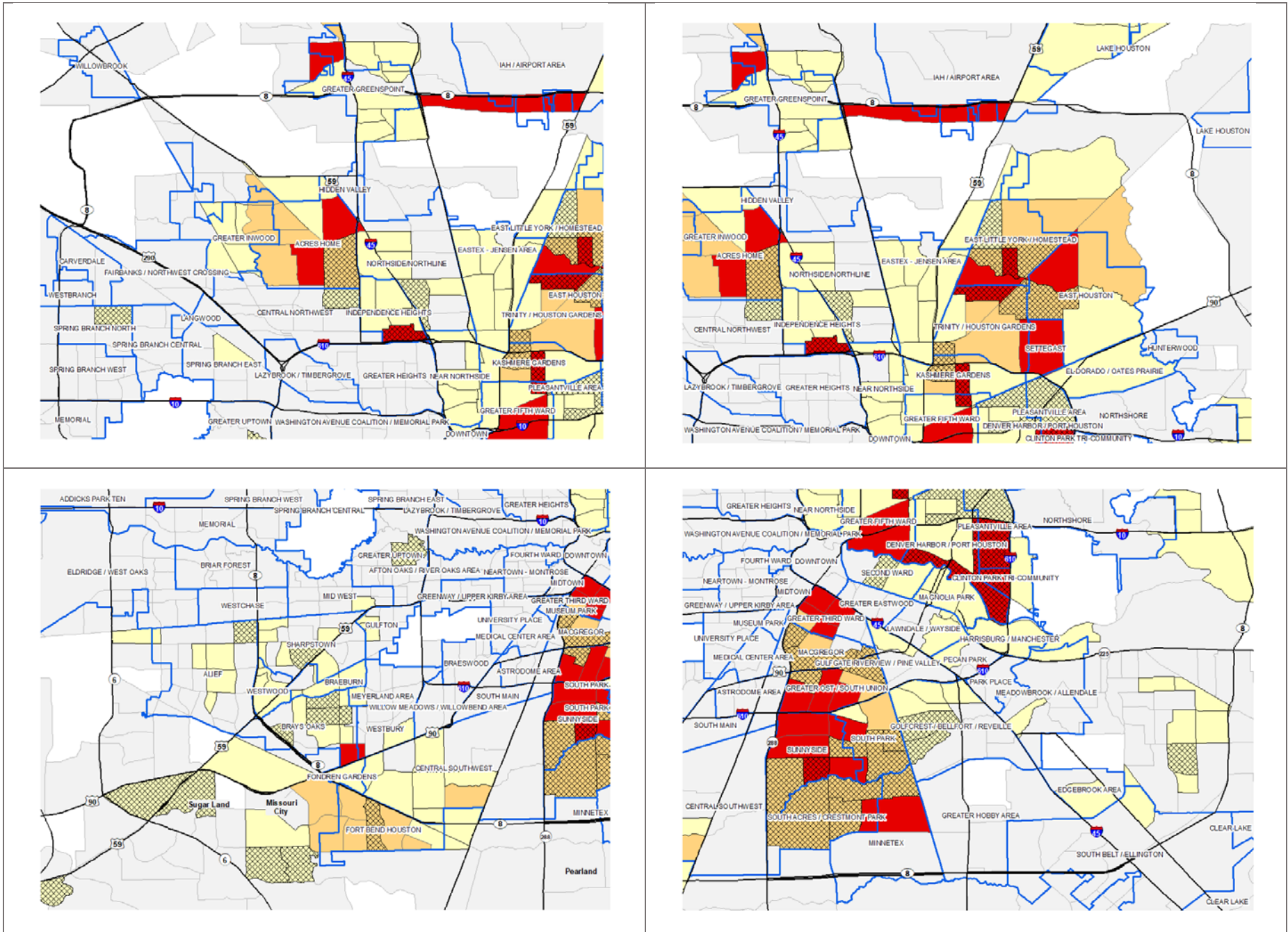
Map 2 builds upon Map 1, and here, we highlight in tan, census tracts with high rates of chronic risk factors in which 50% or more of the population is African American. In red are shown tracts with high rates of chronic disease, the majority of population comprised of African American (50% or more), and 30% or more of population with income at or below federal poverty level. For greater detail on neighborhoods where the high-risk census tracts are located, see Appendix A.1.

Map 3. Census Tracts with Highest Rates of Chronic Risk Factors for COVID-19 Severity, Majority of Hispanic Residents and Highest Concentration of Poverty

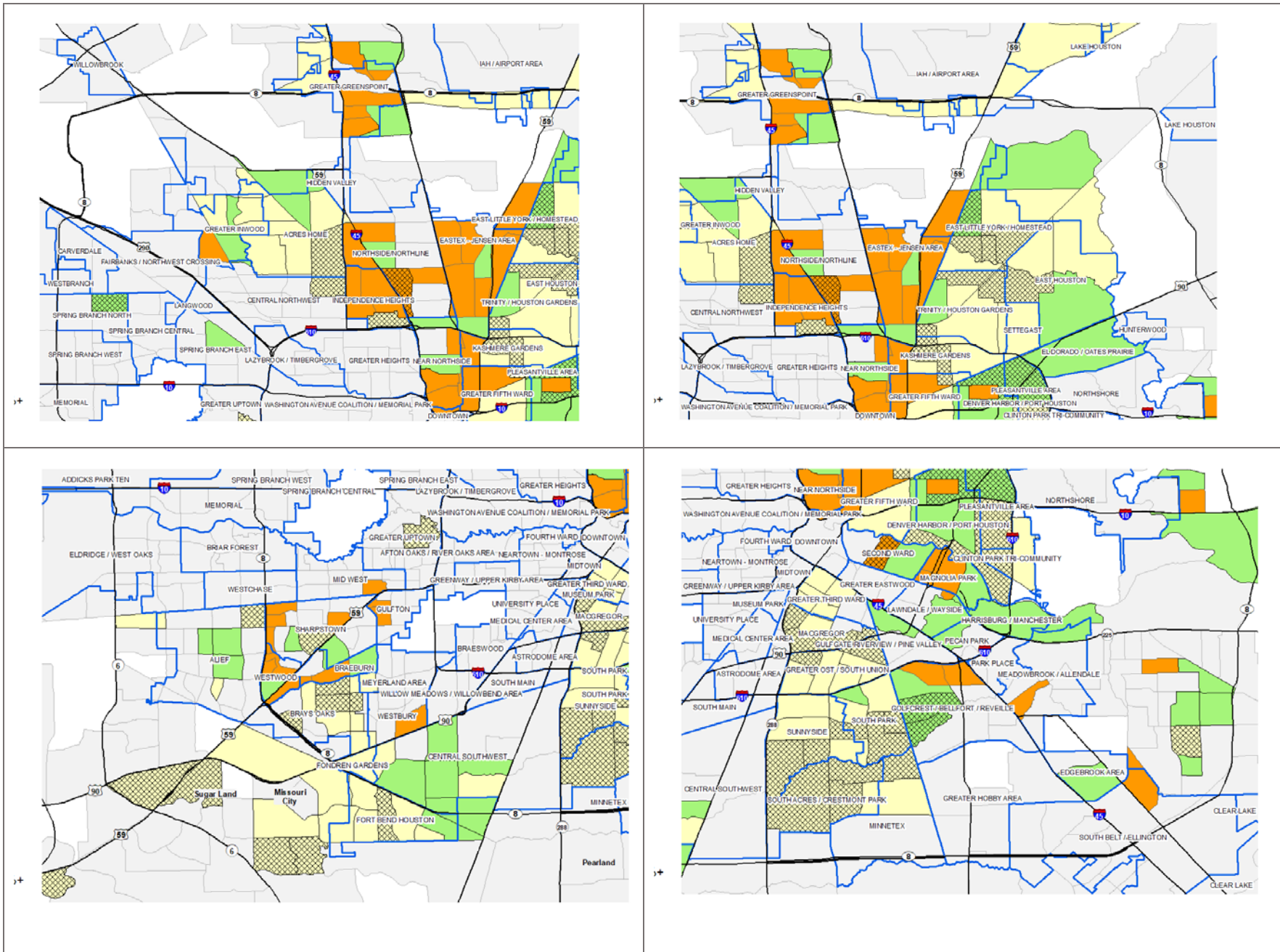


Map 3 is similar to Map 2, except that instead of census tracts with a high composition of African American population, we zero in on census tracts that contain a majority of Hispanic ethnicity population. For greater detail on neighborhoods where the high-risk census tracts are located, see Appendix A.2.

Appendix A.1 Zoom-in of Map of Risk Factors, Age 65 and Older, African American Race and Poverty (see Map 2 for details)



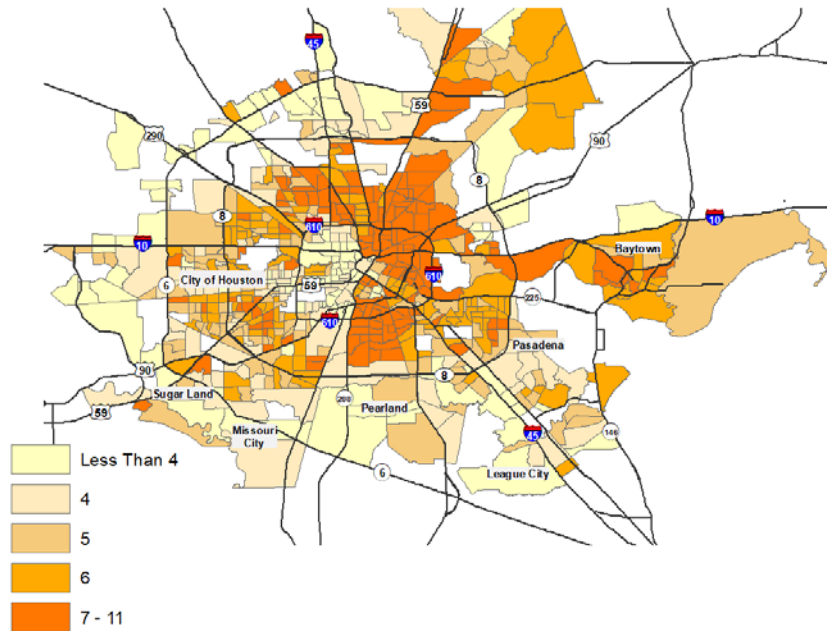
Appendix A.2 Zoom-in of Map of Risk Factors, Age 65 and Older, Hispanic Ethnicity and Poverty (see Map 3 for details)



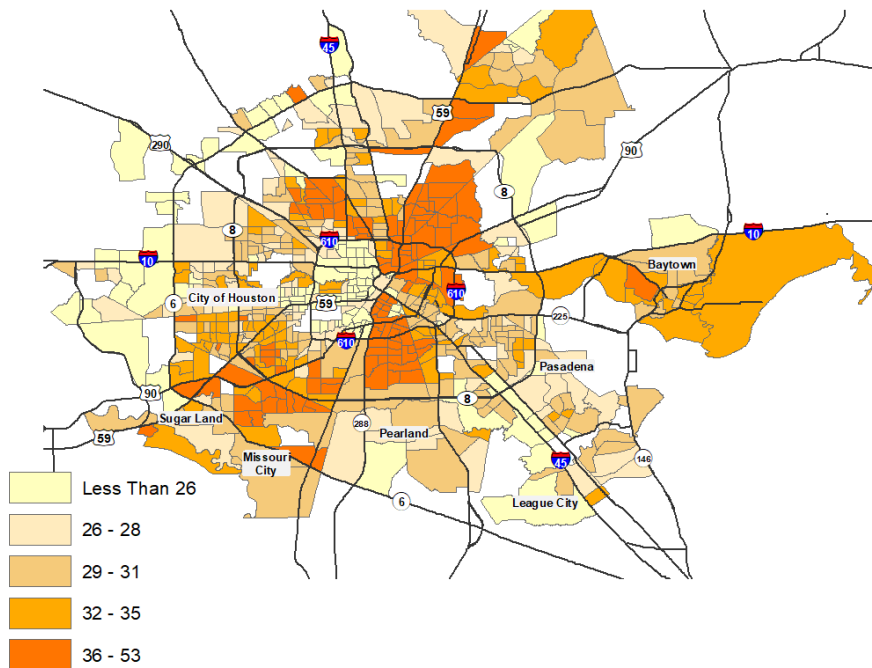
Appendix B. Chronic Conditions Distribution across Greater Houston Area

Our earlier maps of the four risk factors show only those areas with the highest prevalence in the region. It should be noted that these conditions are widespread, even if the concentration of cases in an area did not meet our top 20% cutoff. The following maps show the prevalence of these conditions from lowest to highest percentages.

Map B.1 Coronary Heart Disease (%) across Census Tracts in Houston Area

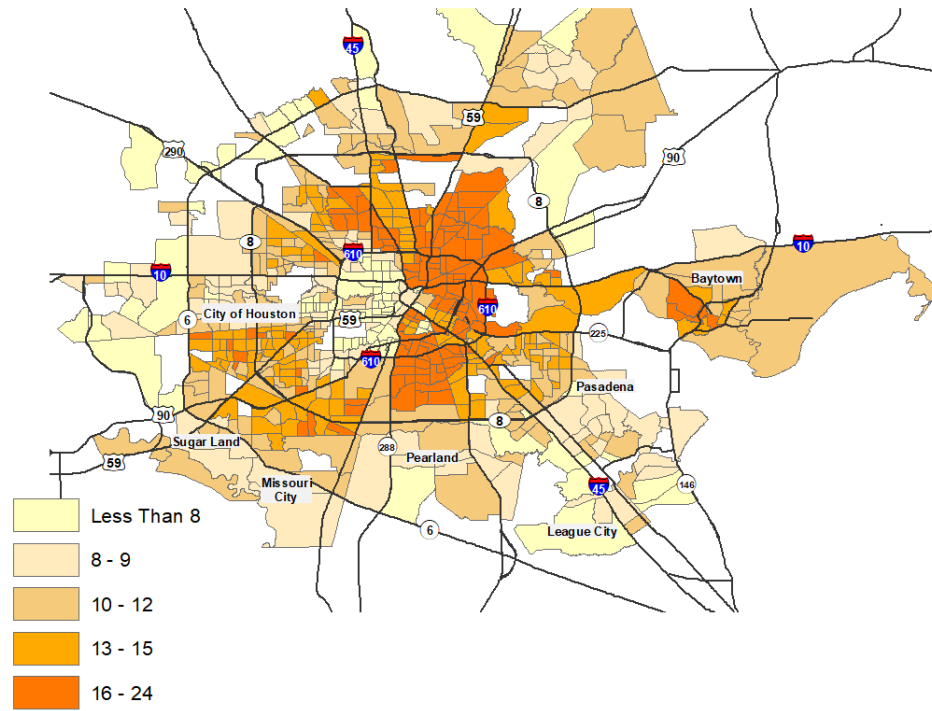


Map B.2 Hypertension (%) across Census Tracts in Houston Area

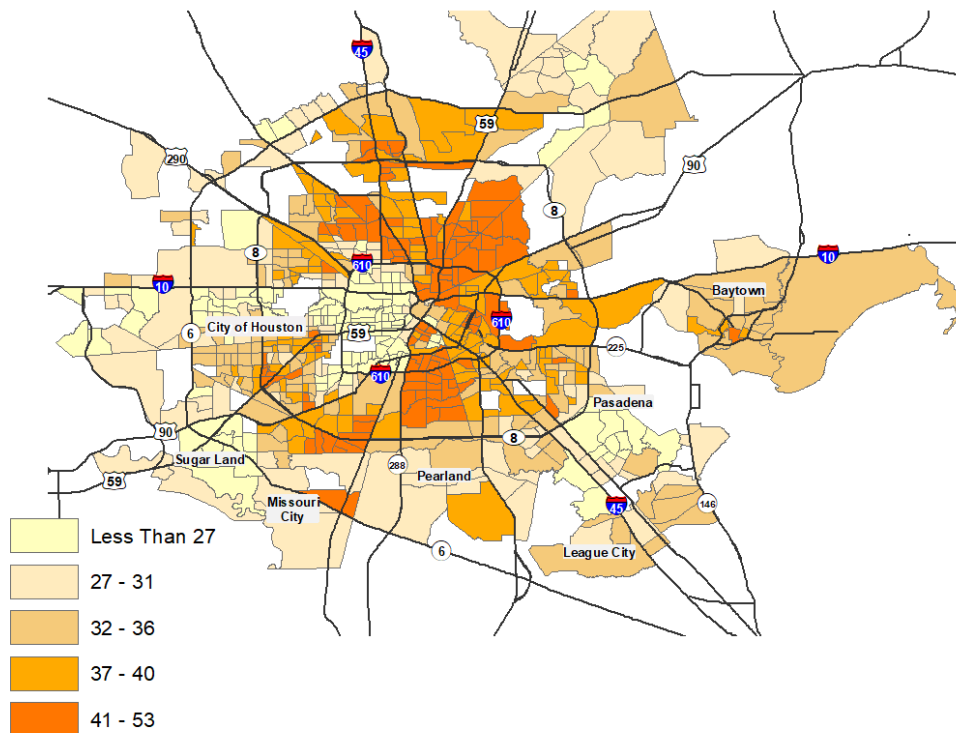




Map B.3 Diabetes Mellitus (%) across Census Tracts in Houston Area



Map B.4 Adult Obesity (%) across Census Tracts in Houston Area



## References

- <sup>1</sup> Wei-jie Guan, Zheng-yi Ni, Yu Hu, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *New England Journal of Medicine* 2020; 382:1708-1720.
- <sup>2</sup> Garg S, Kim L, Whitaker M, O'Halloran A, Cummings C, Holstein R, et al. Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019—COVID-Net, 14 states, March 1-30, 2020. *MMWR Weekly*, 69(15), 458-464. April 17, 2020. DOI: <http://dx.doi.org/10.15585/mmwr.mm6915e3>.
- <sup>3</sup> Kaiser Family Foundation. State Data and Policy Actions to Address Coronavirus. Accessed on May 12, 2020 at: <https://www.kff.org/health-costs/issue-brief/state-data-and-policy-actions-to-address-coronavirus/>.
- <sup>4</sup> John Eligon, Audra D. S. Burch, Dionne Searcey and Richard A. Oppel Jr. Black Americans Face Alarming Rates of Coronavirus Infection in Some States. *The New York Times*. Accessed on April 14, 2020 at: <https://www.nytimes.com/2020/04/07/us/coronavirus-race.html?referringSource=articleShare>.
- <sup>5</sup> Vahidy FS, Nicolas JC, Meeks JR, Khan O, Jones SL, et al., Racial and Ethnic Disparities in SARS-CoV-2 Pandemic: Analysis of a COVID-19 Observational Registry for a Diverse US Metropolitan Population. *medRxiv*, preprint posted April 24, 2020. DOI: <https://doi.org/10.1101/2020.04.24.20073148>.
- <sup>6</sup> Williamson E, Walker AJ, Bhaskaran K, et al., OpenSAFELY: Factors Associated with COVID-19-Related Hospital Death in the Linked Electronic Health Records of 17 Million Adult NHS Patients. *MedRxiv*, Preprint posted May 7, 2020. DOI: <http://doi.org/10.1101/2020.05.06.20092999>.
- <sup>7</sup> 500 Cities Project, US Centers for Disease Control and Prevention. Accessed on May 12, 2020 at <https://www.cdc.gov/500cities/index.htm>.

The Institute for Health Policy

Stephen H. Linder, PhD, Dritana Marko, MD, and Thomas F. Reynolds, PhD

<https://sph.uth.edu/research/centers/ihp/>