The COVID-19 pandemic has exposed socially vulnerable communities to compounded threats. Meanwhile, it has been suggested that communities are disproportionately affected by COVID-19 due to underlying factors such as income disparities, access to healthcare, insurance coverage, and baseline health conditions. Thus, to fully comprehend and reduce the danger COVID-19 poses to a community, it is critical to understand the spatial patterns of social vulnerability, baseline health characteristics, and land-use features, as well as to verify their significance on COVID-19 infection. To fully understand the COVID-19 impact on socially vulnerable populations, this study integrated community vulnerability assessments, public health condition evaluations, population density assessments, and land-use pattern data to identify and map spatial hotspots of COVID-19 transference vulnerability – the probability of a population to transfer COVID-19. Using Houston, TX as the case site, it assessed the relationships between COVID-19 transference vulnerability with socioeconomic, health, and land-use factors at the Super-Neighborhood scale. Through a multivariable regression model, it found that the Super Neighborhoods with a smaller proportion of non-Hispanic White individuals, higher coronary heart disease history prevalence, or lower medium land intensity development were expected to have higher transference vulnerability. The study concludes by discussing the results and offering recommendations to inform more effective planning policies as practitioners work toward health equity to foster more resilient communities.