COVID - 19 Community Vulnerability Index

by the Community Insight and Impact

Background

This is an open source project designed to enable various stakeholders (non-profits, governments, researchers, and citizens) to quantitatively understand and respond to community needs. Critically, CVI incorporates the impact of COVID-19 on communities.

The project deliverable is an interactive web app where users can visualize a variety of health, infrastructure, socio-economic, demographic, policy, and related data at the county level for the US. The platform will also provide a variety of derived metrics that indicate community need along different axes such as risk of severe COVID case complications, risk of severe economic harm, need for mobile health resources, and more (the metrics are described in detail here).

The beta version of the app provides the ability to map these metrics and the underlying variables. Users will be able to select what they want the map to display and interact with the map by zooming in on specific areas, searching for specific counties, and hovering to view precise information. In future versions, we will add additional visualization tools such as plotting summary statistics and comparing counties or areas.

Our data is drawn from a variety of open data sources, and the complete list can be found here. All data has been cleaned and incorporated into a merged dataset with each county identified by its name, state, and FIPS code. This merged and cleaned data set is also available to other researchers as a second deliverable.

Each metric combines a subset of the indicators which are quantile-normalized across all US counties; the normalized indicators are weighted according to predictive power and combined linearly, and the final score is normalized to a 0-100 scale. The indicators and weights for each metric were selected after extensive literature review by our Lit Review team. We are currently undertaking a range of studies to validate and improve these metrics.

Motivation

- COVID will have a lasting effect on a wide-range of factors, including healthcare, economic status, and infrastructure
- Information on COVID's impact is not easily accessible at a mass scale
- Current tools to measure a community's well-being are not prepared to handle the unique circumstances of COVID
- SARS-CoV-2 makes it difficult for non-profit organizations to raise funds and continue providing services.
- The unprecedented pandemic also calls for better understanding of the societal impact of the virus.

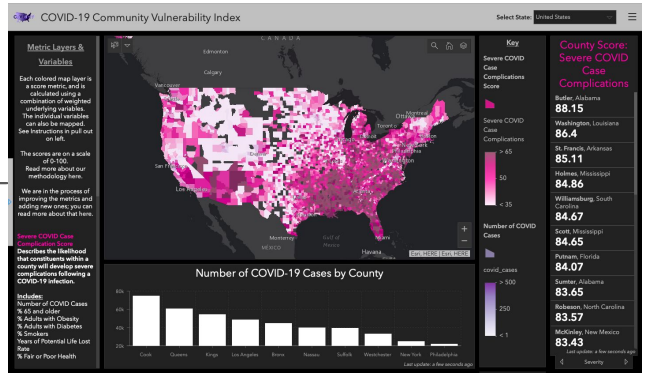
A Unique Solution to understanding COVID

A centralized dashboard capturing metrics to determine a community's vulnerability to COVID at the county level

Interactive map

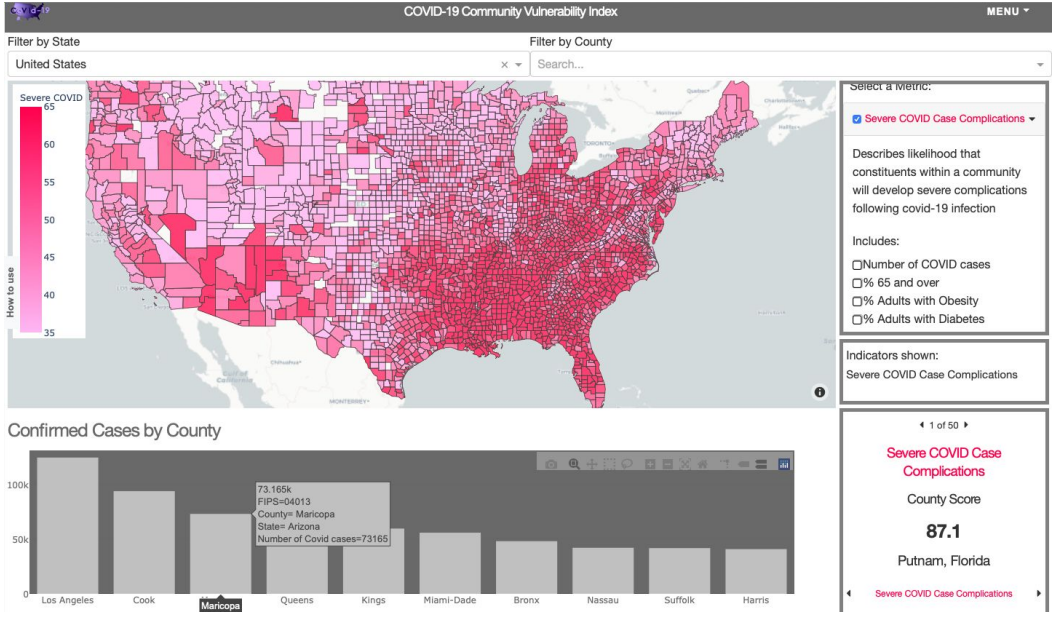
Vulnerability index

Predictive models



Deliverable Results

- A solution that includes a combination of an interactive map and vulnerability indexing.
- The project deliverable is an interactive web app where users can visualize a variety of health, infrastructure, socio-economic, policy, and related data at the county level.
- The platform also provides a variety of derived metrics that indicate community needs along different axes such as information resources, food resources, telehealth resources, and more.
- The main feature is a map with continuously scaled colored layers representing score levels. Other features are interactive score rankings, COVID cases bar chart, and interactive score combinations.



Methods and Future Plans

Our methods:

- Our interactive dashboard app is built on Python and Dash Plotly framework.
- Processing and cleaning the data with Pandas and Python.
- Styling the dashboard with HTML/ CSS, Bootstrap, and Javascript.
- Developing the app with Flask, a lightweight WSGI web application framework, and deploying on Heroku cloud application platform.

Our community dashboard product is currently under user testing with various nonprofit organizations.

Next steps are:

- Initiate a elaborate partnership plan. Current potential partners include Planned Parenthood and UCLA.
- Utilizing machine learning to develop a supervised modeling of hospital admission rates for comparison with our Severe COVID Complication Score.
- Longitudinal Metric Analysis: Replicate dataset and 3 current core metrics for past 10 years (excluding COVID data), analyze time series of scores, and give a summary report.
- Explore various county clustering schemes