

COVID Forecast for Chicago, IL, May 2020

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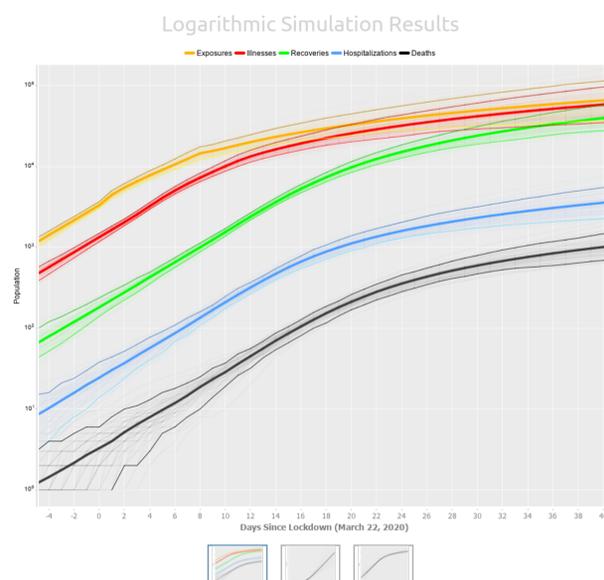
May 02, 2020

covid-19-spread

city: *Chicago, IL*

model type: *agent*

a.



We used an agent-based modeling approach to demonstrate the public health importance of the COVID-19 outbreak in the city of Chicago, IL, USA. Chicago's first case was confirmed on January 24, 2020 via exposure in Wuhan, China, and community transmission is thought to have begun in early March. A "stay-at-home" order was issued in Chicago beginning on March 21 at 5 pm.

On May 1, 2020, we predict there to be 54,977 (90% CI: 34,764; 97,733) cases (confirmed and unconfirmed), 3,333 (90% CI: 2,225; 5,772) total hospital admissions, and 944 (90% CI: 680; 1541) total deaths in the city of Chicago. The effective R_0 is estimated at 0.985 (CI: 0.835; 1.167).

The full model and simulations are presented in panel a on a logarithmic scale. Logarithmic scale of 100 simulations of exposures (yellow), illnesses (red), recoveries (green), hospitalizations (blue), and deaths (black). The average of each simulation category is shown as a bold line in its appropriate color, along with 5th and 95th percentile lines of lighter and darker shades. April 24, 2020 is 33 days after lockdown on March 22, 2020. The exposure simulations diminish after the onset of social distancing on Day 0. Exposure and illness simulations begin to overlap at the end of this simulation period.

By April 24, 2020, the estimate for total illnesses (known and unknown) is 99,636, hospitalizations 5,539, and deaths 1,499. Actual and projected deaths are presented on a linear scale (panel b) and logarithmic scale (panel c). For panel b and panel c, black lines represent 100 modeling simulations with the simulation average in bold. Red squares represent reported surveillance data. May 10, 2020 is 49 days after March 22, 2020.

We predict total deaths to reach 1,430 by May 10, 2020. We predict 58,356 (90% CI: 35,942; 105,174) cases, known and unknown, as of April 25, 2020, which exceeds the confirmed Chicago case counts of 17,303; we find this plausible given the lack of tests and necessary restriction of testing to the very ill. IDPH reports COVID-19 hospitalizations as 4,699 on April 24, 2020, lower than our model's 5,539. Our model predicts 1,499 deaths on that same date, lower than the reported 1,795. The overlap between exposures and illnesses at the end of the simulation emphasizes the need for shorter-term predictions.

It is important to note that our model assumes continued observation of the current mitigation efforts. If social interaction should increase, then there could be a significant increase in new COVID-19 cases beyond what is predicted by this model.

For methods and complete list of model parameters see.

References:

1) <https://doi.org/10.1146/annurev-publhealth-040617-014317>

Protocols:

1) Agent-based modeling of COVID-19 in Chicago, IL - Methods and Appendix

Code:

1) Terminus

Datasets:

1) Chicago COVID Predictions 2020-04-22



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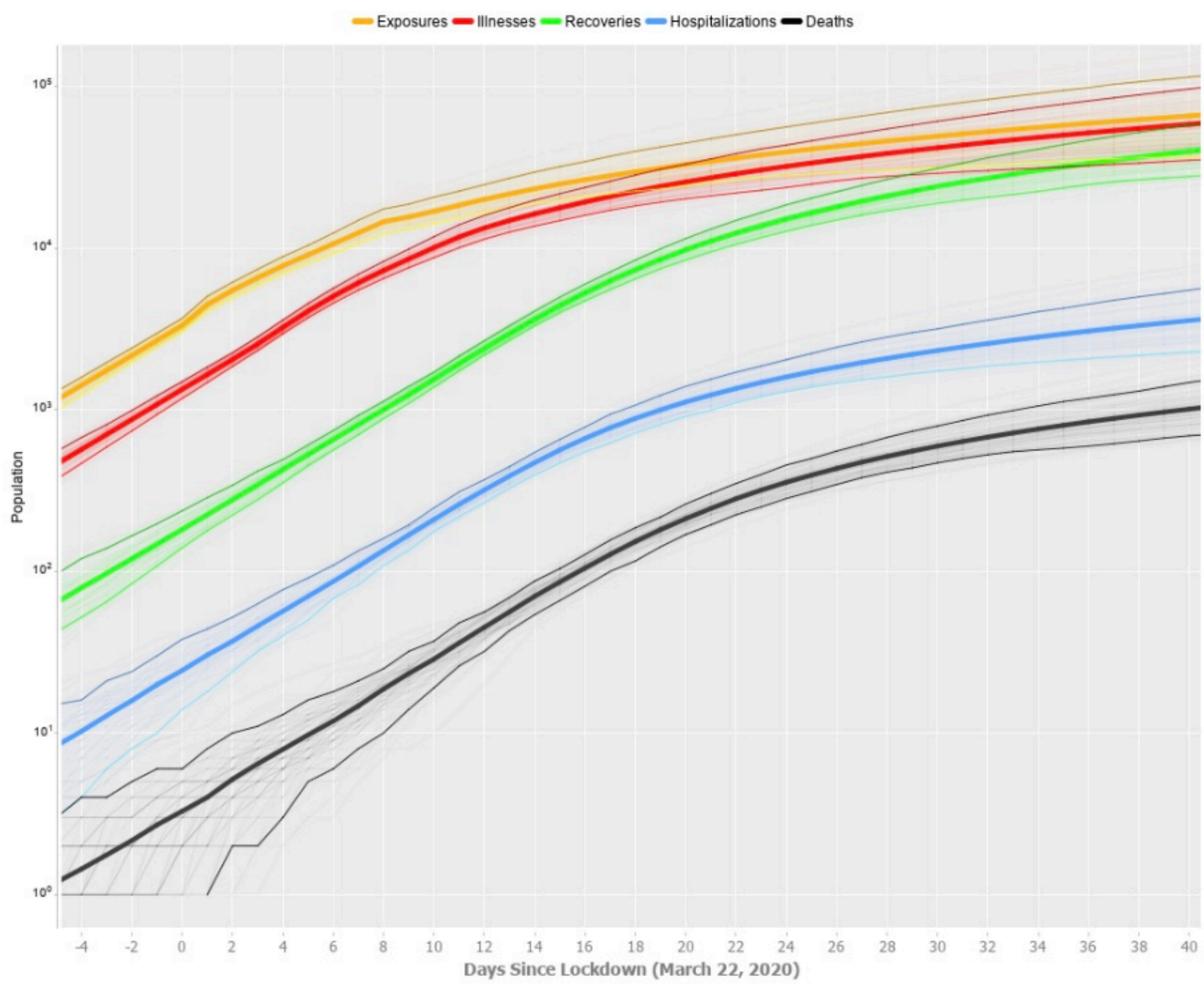
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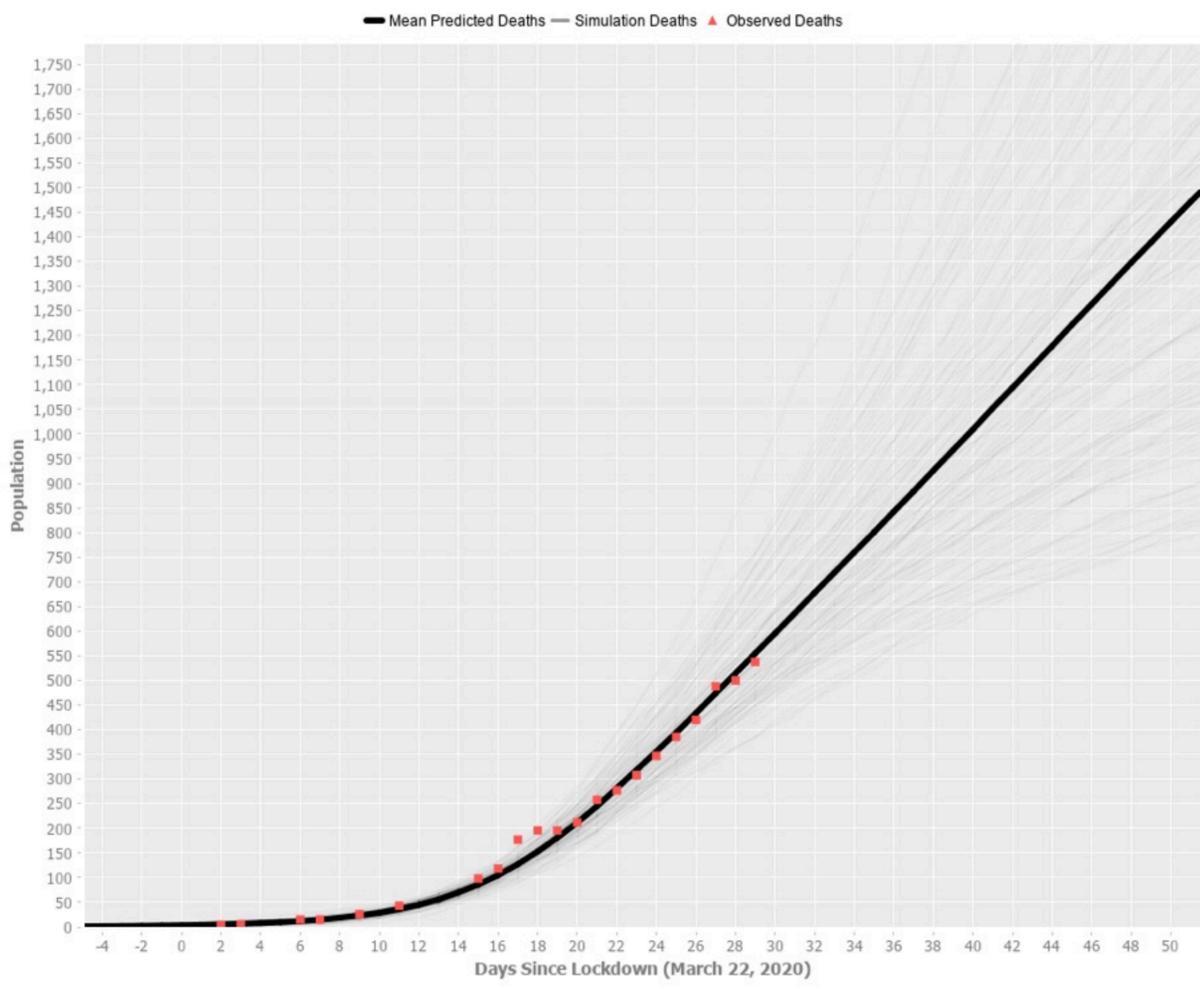
a

Logarithmic Simulation Results



b

Simulated and Actual Death Counts



C

Logarithmic Death Counts

