

Protecting Public Health and Preserving the Financial Viability of North Carolina's Critical Health Care Facilities during Infectious Disease Outbreaks

Harrison B. Zeff^{1,2}, Nicholas DeFelice^{3,4} and Gregory W. Characklis^{1,2}

Hospitals represent a critical line of defense against the impacts of the SARS-CoV-2 virus, and while the primary emphasis has been on ensuring sufficient hospital capacity (e.g., ICU beds, ventilators), the impacts of the COVID-19 pandemic on the financial viability of hospitals and other primary care facilities has become a critical concern. In anticipation of a wave of COVID patients, hospitals shut down essentially all non-emergency procedures to ensure that as much capacity as possible was available to treat these patients. This was a cautious, but sensible, decision in an environment in which data were scarce and much about the virus and how it spread was unknown. Nonetheless, it came with tremendous costs as limiting all non-COVID and non-emergency procedures is currently driving losses of over \$1 Billion per month for hospitals in North Carolina alone (NCHA 2020), with losses mounting so quickly that the North Carolina Health Care Association has made an urgent request to Governor Cooper that funds to address hospital shortfalls be included in the state's upcoming budget. To make matters worse, it appears that these losses are much worse than they needed to be, as new information now coming available suggests that substantial portions of hospital capacity have gone unused during the crisis, even during the periods of greatest infection. This suggests that more carefully calibrated policies, involving decisions based on real-time data describing the extent and expansion of the infected population, as well as the supplies of critical hospital capacity, could protect public health while still limiting financial losses.

This points to a critical need for improved policies regarding how to modify and/or expand hospital capacity in the face of an infectious disease outbreak, policies that support decisions needed to ensure both the protection of public health and the financial viability of health care infrastructure. This problem is not limited only to North Carolina, as revenue losses caused by the suspension of non-emergency procedures contributed to the loss of 1.4 million health care service jobs across the U.S. in April 2020 alone (BLS, 2020). The American Hospital Association estimates the aggregate financial impact to hospitals and health systems will be \$200 billion over the four month period from March to June 2020, including \$160 billion in lost revenue from non-emergency procedures (AHA, 2020). This exacerbates current trends in which falling revenues were already driving higher rates of hospital closures, particularly in rural areas (Balasubramanian and Jones, 2016; Topchik et al., 2020).

This research will develop more innovative policies to guide hospital decisions on how to manage health care capacity and critical care needs during a pandemic, more specifically, we will:

- 1) Use data on the number of new infections, testing policies, and hospitalization rates to assess demand for health care capacity and equipment;
- 2) Combine data on the demand for health care capacity/equipment with information on both the current supply of capacity/equipment, as well as the availability of additional capacity/equipment (e.g., temporary facilities) and the time required to bring it online;
- 3) Evaluate the financial losses and risk posed by the existing policies being used by hospitals and health care facilities to manage their current capacity/equipment;
- 4) Design improved policies on when and how much hospital capacity to reserve for COVID-19 patients during an outbreak, with decisions based on thresholds in areas described in (1), and then assess public health outcomes and financial risk under conditions of uncertainty.

The proposed research will take advantage of the modeling and financial risk management expertise of Drs. Characklis and Zeff in UNC's Center on Financial Risk in Environmental Systems, as well as the public health modeling expertise of Dr. DeFelice (Ph.D. UNC SPH 2014) of the Mount Sinai Icahn School of Medicine. This project will make use of unique datasets acquired in partnership with Mt. Sinai and Duke Hospitals, as well as contacts with hospital planning personnel in both NC and NY. Preliminary results showing current and projected hospital capacity in NYC can be seen in Figure 1.

¹ Department of Environmental Sciences and Engineering, Gillings School of Global Public Health, University of North Carolina at Chapel Hill

² Center on Financial Risk in Environmental Systems, Gillings School of Global Public Health and UNC Institute for the Environment, University of North Carolina at Chapel Hill

³ Department of Environmental Medicine and Public Health at the Icahn School of Medicine at Mount Sinai

⁴ Mount Sinai Institute for Exposomic Research Icahn School of Medicine at Mount Sinai

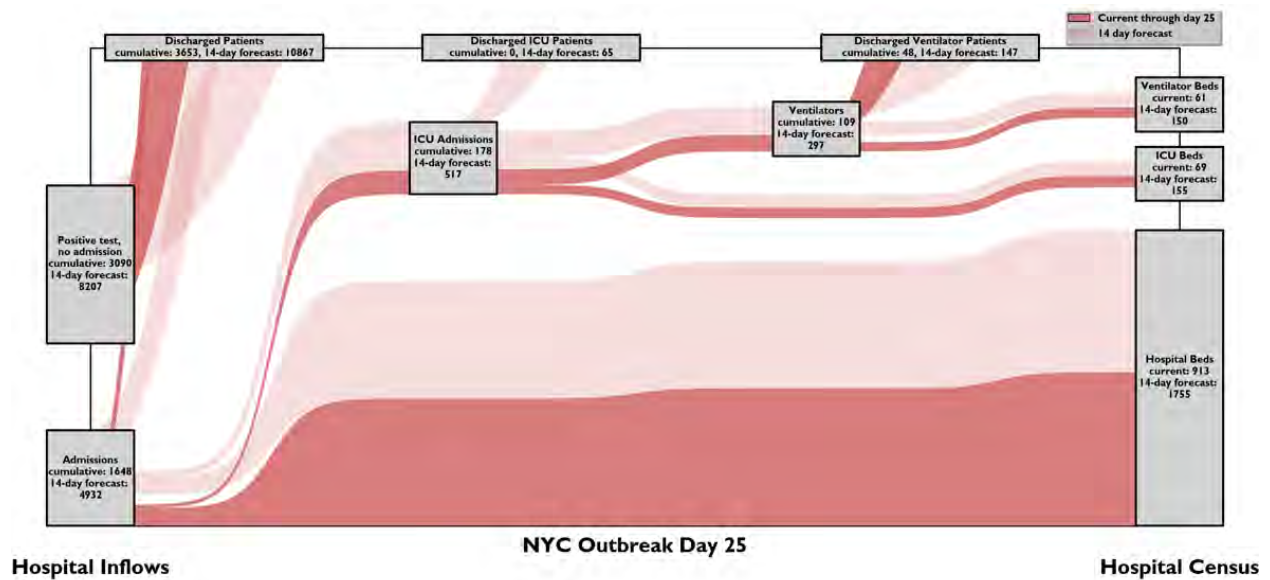


Figure 1 Projections of COVID patients and their usage of hospital capacity 14 days in advance using current observations and known relationships for Mount Sinai Hospitals in NYC.. Made on the 25th day after onset of outbreak. Partnership with Duke Hospitals is underway and discussions with UNC Healthcare have begun.

High-Level Budget

Personnel (PI, Post-doc, Consultant (Dr. DeFelice), Ph.D. student):	\$100,000
Ph.D. student tuition:	\$ 5,000
Equipment	\$4,000
Travel (Characklis/Zeff: UNC to NYC; DeFelice: NYC to UNC):	\$7,000
Project Total:	\$116,000

EHRA Salary	\$38,589
SHRA Salary	\$0
Grad Student	\$10,993
Temps	\$0
Fringe Pool	\$14,172
Non-Personnel Expenses*	\$52,246
Total	\$116,000

*Includes funds for consultant, Ph.D. student tuition, equipment and travel

References

The American Hospital Association (2020). Hospitals and Health Systems Face Unprecedented Financial Pressures Due to COVID-19. Available at: <https://www.aha.org/system/files/media/file/2020/05/aha-covid19-financial-impact-0520-FINAL.pdf>

Balasubramanian, S., and E. Jones (2016). Hospital closures and the current healthcare climate: the future of rural hospitals in the USA. *Rural and Remote Health*, 16(3).

Bureau of Labor Statistics (2020). Employment Situation Summary. 8 May 2020. Available at: <https://www.bls.gov/news.release/empst.nr0.htm>

The Centers for Medicare and Medicaid Services (2020). CMS Releases Recommendations on Adult Elective Surgeries, Non-Essential Procedures During COVID-19 Response. Available at: <https://www.cms.gov/newsroom/press-releases/cms-releases-recommendations-adult-elective-surgeries-non-essential-medical-surgical-and-dental>

North Carolina Healthcare Association, "Statement on Gov. Cooper Budget for Coronavirus Relief: Hospitals' financial recovery from COVID-19 should be a priority," *Businesswire*, April 25, 2020, <https://www.businesswire.com/news/home/20200425005010/en/NC-Healthcare-Association-Statement-Gov.-Cooper-Budget>

Topchik, M., Gross, K., Pinette, M., Brown, T., Balfour, B., and H. Kein (2020). *The Rural Health Safety Net Under Pressure: Rural Hospital Vulnerability*. The Chartis Center for Rural Health, February 2020. Available at: <https://www.chartis.com/forum/insight/the-rural-health-safety-net-under-pressure-rural-hospital-vulnerability/>