Online Maps of Patients at High Risk for Severe COVID-19 and the Estimated Availability of Critical Care Beds.

This tool shows county-level demand of populations at high risk for severe COVID-19 across the United States. It also shows supply estimates of hospital critical care beds, including ICU beds and other hospital beds that could be used for critical care purposes, under various scenarios of hospital’s response to patient surges. The tool also shows the number of people age 65+ per available bed under surge response conditions. We chose to map counts of people rather than percentages because it is the number of people at risk for severe disease that is key to service planning.

The high risk groups we have mapped are individuals 65 years and older, Medicare patients with chronic obstructive pulmonary disease, Medicare patients with diabetes, Medicare patients with coronary artery disease and Medicare patients with chronic kidney disease. We have also estimated the number of critical beds that could be made available for patient surges under three scenarios of varying hospital response intensity. These scenarios take into account existing ICU bed availability, currently occupied ICU beds that can be made available, other beds such as PACU, OR, and step-down beds that could be converted to critical care beds for COVID-19 patients and the possibility of having two patients use one ventilator in ICU. All civilian acute medical-surgical tertiary care hospitals and LTAC hospitals for which data were available in the US are included. Methods, assumptions, data sources, and references are described in more detail below.

New data and features will be regularly updated and added. Questions or comments can be directed to Andrew Rundle agr3@cumc.columbia.edu, Associate Professor of Epidemiology, Mailman School of Public Health.

**Acronyms:**
ICU = intensive care unit
OR = operating room
PACU = post-anesthesia care unit
LTAC = long-term acute care
CMS = Centers for Medicare & Medicaid Services
AHA = American Hospital Association
AHRF = Area Health Resources File

**Methods:**
County critical care bed surge capacity assumptions - March 26th 2020
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Critical care bed surge capacity estimates were calculate as follows,

**Assumptions for Low Intensity Response to a critical care surge:**
(1) 30% of existing ICU beds, step-down beds, OR beds, PACU beds, and LTAC ICU beds are unoccupied and available
(2) 30% of existing ICU beds, step-down beds, OR beds, PACU beds, and LTAC ICU beds can be cleared and made available
(3) ICU bed counts per hospital were summed as any reported: (a) general medical-surgical ICU beds, (b) surgical ICU beds, (c) coronary ICU beds, (d) burn care ICU beds, (e) pediatric ICU beds, and (f) other ICU beds; neonatal ICU beds were excluded
(4) ICU beds are obtained as the highest reported number of ICU beds reported by each hospital in either the CMS data, the AHA data, or the AHRF data
(5) Step-down bed counts were used where reported by hospitals; if hospitals did not report step-down beds, a 1:4 step-down-to-ICU bed ratio was assumed and ICU bed counts were multiplied by 1.25
(6) One bed per OR was assumed; hospitals did not report PACU beds and a 1.5:1 PACU beds to OR ratio was assumed and ORs were multiplied by 1.5
(7) LTAC ICU bed counts were summed as any reported: (a) general medical-surgical LTAC ICU beds, (b) surgical LTAC ICU beds, (c) coronary LTAC ICU beds, (d) burn care LTAC ICU beds, (e) pediatric LTAC ICU beds, and (f) other LTCA ICU beds; neonatal LTAC ICU beds were excluded

Assumptions for Medium Intensity Response to a critical care surge:
(1) 30% of existing ICU beds, step-down beds, OR beds, PACU beds, and LTAC ICU beds are unoccupied and available
(2) 50% of existing ICU beds, step-down beds, OR beds, PACU beds, and LTAC ICU beds can be cleared and made available
(3) ICU bed counts per hospital were summed as any reported: (a) general medical-surgical ICU beds, (b) surgical ICU beds, (c) coronary ICU beds, (d) burn care ICU beds, (e) pediatric ICU beds, and (f) other ICU beds; neonatal ICU beds were excluded
(4) ICU beds are obtained as the highest reported number of ICU beds reported by each hospital in either the CMS data, the AHA data, or the AHRF data
(5) Step-down bed counts were used where reported by hospitals; if hospitals did not report step-down beds, a 1:4 step-down-to-ICU bed ratio was assumed and ICU bed counts were multiplied by 1.25
(6) One bed per OR was assumed; hospitals did not report PACU beds and a 1.5:1 PACU beds to OR ratio was assumed and ORs were multiplied by 1.5
(7) LTAC ICU bed counts were summed as any reported: (a) general medical-surgical LTAC ICU beds, (b) surgical LTAC ICU beds, (c) coronary LTAC ICU beds, (d) burn care LTAC ICU beds, (e) pediatric LTAC ICU beds, and (f) other LTCA ICU beds; neonatal LTAC ICU beds were excluded

Assumptions for High Intensity Response to a critical care surge:
(1) 30% of existing ICU beds, step-down beds, OR beds, PACU beds, and LTAC ICU beds are unoccupied and available
(2) 50% of existing ICU beds, step-down beds, OR beds, PACU beds, and LTAC ICU beds can be cleared and made available
(3) All available ICU and step down beds can be modified to service 2 patients per ventilator
(4) ICU bed counts per hospital were summed as any reported: (a) general medical-surgical ICU beds, (b) surgical ICU beds, (c) coronary ICU beds, (d) burn care ICU beds, (e) pediatric ICU beds, and (f) other ICU beds; neonatal ICU beds were excluded
(5) ICU beds are obtained as the highest reported number of ICU beds reported by each hospital in either the CMS data, the AHA data, or the AHRF data
(6) Step-down bed counts were used where reported by hospitals; if hospitals did not report step-down beds, a 1:4 step-down-to-ICU bed ratio was assumed and ICU bed counts were multiplied by 1.25

(7) One bed per OR was assumed; hospitals did not report PACU beds and a 1.5:1 PACU beds to OR ratio was assumed and ORs were multiplied by 1.5

(8) LTAC ICU bed counts were summed as any reported: (a) general medical-surgical LTAC ICU beds, (b) surgical LTAC ICU beds, (c) coronary LTAC ICU beds, (d) burn care LTAC ICU beds, (e) pediatric LTAC ICU beds, and (f) other LTCA ICU beds; neonatal LTAC ICU beds were excluded

Data sources:
(1) Centers for Medicare & Medicaid Services (CMS), Health Care Information System (HCRIS) Data File, Sub-System Hospital Cost Report (CMS-2552-96 and CMS-2552-10), Section S-3, Part 1, Column 2, 2020
(2) American Hospital Association (AHA) Annual Survey, American Hospital Association, Chicago, Illinois, 2018
(3) The Area Health Resources Files (AHRF), US DHHS Health Resources and Services Administration, Washington, DC, 2020
(4) Centers for Medicare & Medicaid Services (CMS), Medicare Provider of Services file, Medicare Cost Report, Hospital Compare Files, 2017-2019
(5) Data on population counts by age and numbers of residents with chronic at risk diseases were downloaded from PolicyMap, https://www.policymap.com.

References:
(6) Toner, E. and Waldhorn, R., 2010. Survey of mechanical ventilators in US acute care hospitals: a baseline for critical care surge capacity planning. Disaster medicine and