

## IEM's AI Modeling: Short-term COVID-19 Projections

Date: 2/8/21

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

**We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.**

### AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 2/8/21 9 a.m.

**Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.**

**Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.**

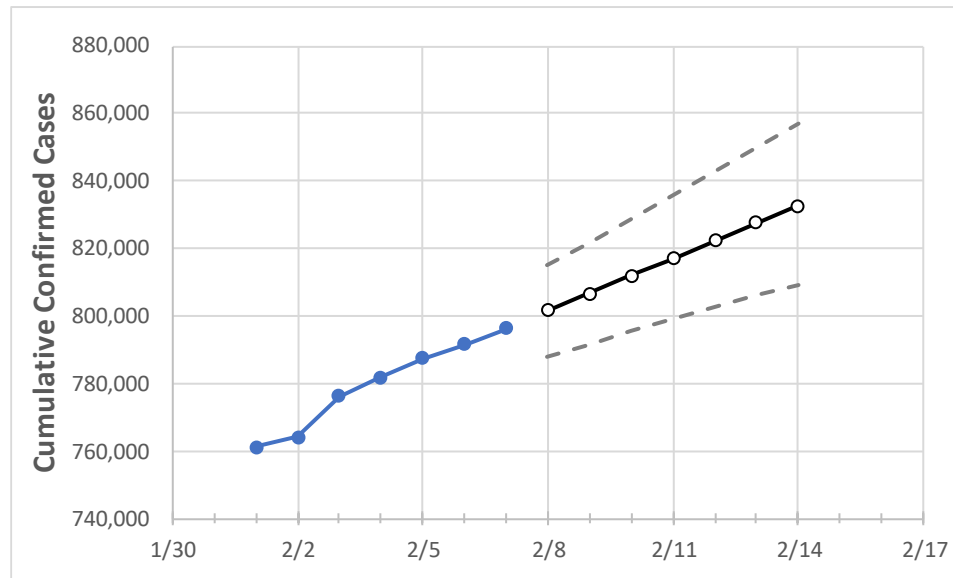
### IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

## North Carolina State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	
North Carolina	781,802	787,349	791,521	796,195	801,513	806,798	812,031	817,144	822,219	827,543	832,604	

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

## North Carolina Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	
Cumberland	21,278	21,481	21,723	21,894	22,126	22,362	22,611	22,851	23,104	23,354	23,608	
Durham	19,837	19,932	20,015	20,100	20,205	20,310	20,414	20,516	20,616	20,716	20,813	
Guilford	36,238	36,481	36,716	36,946	37,208	37,469	37,722	37,977	38,223	38,470	38,718	
Mecklenburg	88,564	89,056	89,511	90,074	90,567	91,044	91,512	91,968	92,419	92,851	93,275	
Orange	6,992	7,050	7,094	7,127	7,184	7,239	7,297	7,356	7,414	7,471	7,530	
Union	18,827	18,940	19,044	19,161	19,278	19,393	19,506	19,617	19,730	19,839	19,946	
Wake	67,475	67,980	68,460	68,893	69,421	69,941	70,457	70,980	71,480	71,979	72,485	

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

### North Carolina Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	2/4	2/5	2/6	2/7	2/9				2/11				2/13			
Cumberland	21,278	21,481	21,723	21,894	22,362	(4,472)	[1,073]	{537}	22,851	(4,570)	[1,097]	{548}	23,354	(4,671)	[1,121]	{560}
Durham	19,837	19,932	20,015	20,100	20,310	(4,062)	[975]	{487}	20,516	(4,103)	[985]	{492}	20,716	(4,143)	[994]	{497}
Guilford	36,238	36,481	36,716	36,946	37,469	(7,494)	[1,798]	{899}	37,977	(7,595)	[1,823]	{911}	38,470	(7,694)	[1,847]	{923}
Mecklenburg	88,564	89,056	89,511	90,074	91,044	(18,209)	[4,370]	{2,185}	91,968	(18,394)	[4,414]	{2,207}	92,851	(18,570)	[4,457]	{2,228}
Orange	6,992	7,050	7,094	7,127	7,239	(1,448)	[347]	{174}	7,356	(1,471)	[353]	{177}	7,471	(1,494)	[359]	{179}
Union	18,827	18,940	19,044	19,161	19,393	(3,879)	[931]	{465}	19,617	(3,923)	[942]	{471}	19,839	(3,968)	[952]	{476}
Wake	67,475	67,980	68,460	68,893	69,941	(13,988)	[3,357]	{1,679}	70,980	(14,196)	[3,407]	{1,704}	71,979	(14,396)	[3,455]	{1,728}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.