

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

Date: 4/16/21

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 4/16/21 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.**

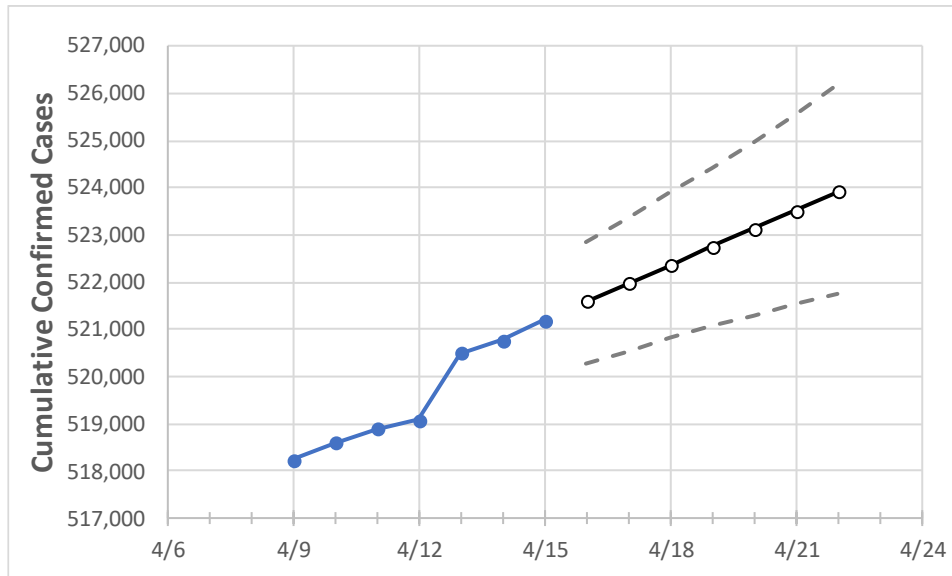
### IEM's Modeling Lead

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.

Alabama State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	
Alabama	519,071	520,503	520,780	521,201	521,587	521,977	522,360	522,745	523,136	523,511	523,909	

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.

Alabama Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21	4/22	
Jefferson	75,413	75,409	75,372	75,398	75,437	75,476	75,510	75,547	75,582	75,615	75,649	
Lee	15,533	15,541	15,552	15,567	15,576	15,585	15,595	15,605	15,614	15,623	15,632	
Madison	33,868	33,898	33,940	34,002	34,030	34,059	34,088	34,117	34,146	34,176	34,205	
Marshall	11,962	11,967	11,982	11,988	11,993	11,999	12,004	12,009	12,014	12,018	12,023	
Mobile	37,774	38,938	38,951	39,011	39,033	39,054	39,076	39,097	39,118	39,139	39,160	
Montgomery	23,969	23,992	23,980	23,996	24,010	24,023	24,037	24,050	24,062	24,074	24,084	
Shelby	23,112	23,124	23,141	23,160	23,168	23,176	23,184	23,191	23,198	23,205	23,211	
Tuscaloosa	25,283	25,297	25,318	25,329	25,343	25,357	25,370	25,383	25,397	25,410	25,423	

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.

### Alabama Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	4/12	4/13	4/14	4/15	4/17			4/19			4/21					
Jefferson	75,413	75,409	75,372	75,398	75,476	(15,095)	[3,623]	{1,811}	75,547	(15,109)	[3,626]	{1,813}	75,615	(15,123)	[3,630]	{1,815}
Lee	15,533	15,541	15,552	15,567	15,585	(3,117)	[748]	{374}	15,605	(3,121)	[749]	{375}	15,623	(3,125)	[750]	{375}
Madison	33,868	33,898	33,940	34,002	34,059	(6,812)	[1,635]	{817}	34,117	(6,823)	[1,638]	{819}	34,176	(6,835)	[1,640]	{820}
Marshall	11,962	11,967	11,982	11,988	11,999	(2,400)	[576]	{288}	12,009	(2,402)	[576]	{288}	12,018	(2,404)	[577]	{288}
Mobile	37,774	38,938	38,951	39,011	39,054	(7,811)	[1,875]	{937}	39,097	(7,819)	[1,877]	{938}	39,139	(7,828)	[1,879]	{939}
Montgomery	23,969	23,992	23,980	23,996	24,023	(4,805)	[1,153]	{577}	24,050	(4,810)	[1,154]	{577}	24,074	(4,815)	[1,156]	{578}
Shelby	23,112	23,124	23,141	23,160	23,176	(4,635)	[1,112]	{556}	23,191	(4,638)	[1,113]	{557}	23,205	(4,641)	[1,114]	{557}
Tuscaloosa	25,283	25,297	25,318	25,329	25,357	(5,071)	[1,217]	{609}	25,383	(5,077)	[1,218]	{609}	25,410	(5,082)	[1,220]	{610}

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.