

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

**Date: 12/7/20**

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 12/7/20 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.**

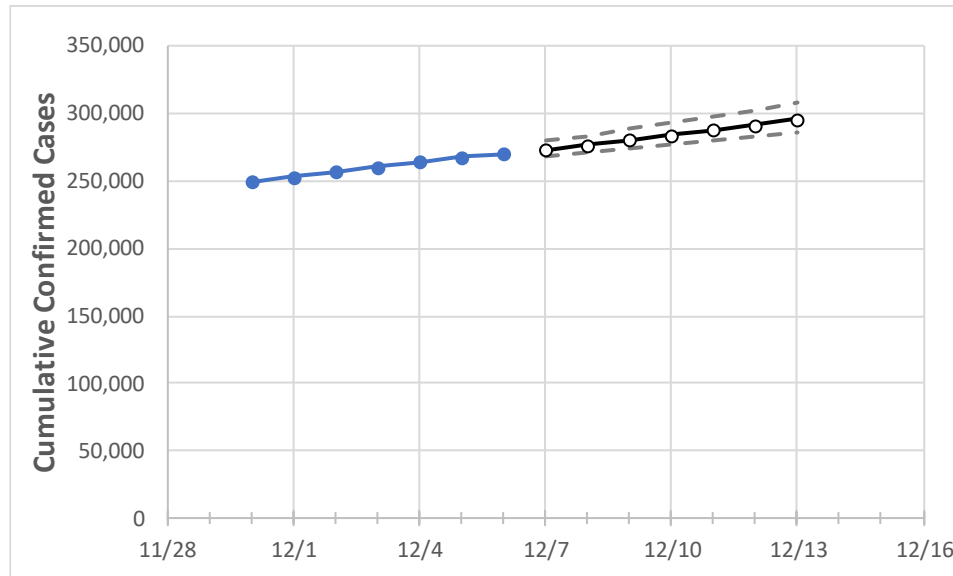
### **IEM's Modeling Lead**

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:						
	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13
Alabama	260,359	264,199	267,589	269,877	273,189	276,623	280,181	283,869	287,691	291,651	295,753

*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 20%, and are often within 10%, of actual confirmed cases.*

## Alabama Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13
Jefferson	34,716	35,310	36,002	36,475	37,061	37,673	38,311	38,978	39,673	40,399	41,156
Lee	8,015	8,071	8,131	8,171	8,221	8,272	8,325	8,379	8,434	8,490	8,548
Madison	14,215	14,521	14,854	15,090	15,364	15,651	15,952	16,267	16,597	16,943	17,305
Marshall	6,750	6,953	7,063	7,133	7,240	7,353	7,470	7,592	7,720	7,854	7,993
Mobile	20,452	20,626	20,764	20,869	20,992	21,118	21,248	21,382	21,521	21,663	21,809
Montgomery	12,731	12,844	12,919	13,003	13,079	13,156	13,235	13,316	13,398	13,482	13,569
Shelby	11,102	11,278	11,450	11,546	11,704	11,867	12,035	12,210	12,390	12,576	12,768
Tuscaloosa	13,755	13,897	14,065	14,182	14,314	14,451	14,591	14,735	14,884	15,036	15,193

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:											
	12/3	12/4	12/5	12/6	12/8				12/10				12/12			
Jefferson	34,716	35,310	36,002	36,475	37,673	(7,535)	[1,808]	{904}	38,978	(7,796)	[1,871]	{935}	40,399	(8,080)	[1,939]	{970}
Lee	8,015	8,071	8,131	8,171	8,272	(1,654)	[397]	{199}	8,379	(1,676)	[402]	{201}	8,490	(1,698)	[408]	{204}
Madison	14,215	14,521	14,854	15,090	15,651	(3,130)	[751]	{376}	16,267	(3,253)	[781]	{390}	16,943	(3,389)	[813]	{407}
Marshall	6,750	6,953	7,063	7,133	7,353	(1,471)	[353]	{176}	7,592	(1,518)	[364]	{182}	7,854	(1,571)	[377]	{188}
Mobile	20,452	20,626	20,764	20,869	21,118	(4,224)	[1,014]	{507}	21,382	(4,276)	[1,026]	{513}	21,663	(4,333)	[1,040]	{520}
Montgomery	12,731	12,844	12,919	13,003	13,156	(2,631)	[631]	{316}	13,316	(2,663)	[639]	{320}	13,482	(2,696)	[647]	{324}
Shelby	11,102	11,278	11,450	11,546	11,867	(2,373)	[570]	{285}	12,210	(2,442)	[586]	{293}	12,576	(2,515)	[604]	{302}
Tuscaloosa	13,755	13,897	14,065	14,182	14,451	(2,890)	[694]	{347}	14,735	(2,947)	[707]	{354}	15,036	(3,007)	[722]	{361}

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.