

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/29/21**

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 9/29/21 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.

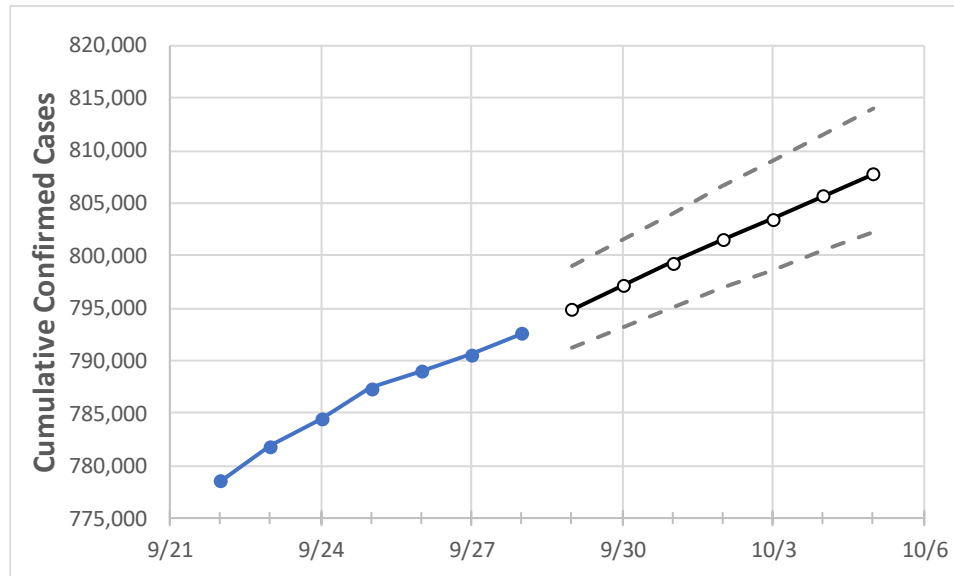
IEM's Modeling Lead

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:						
	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5
Alabama	787,421	789,054	790,648	792,632	794,914	797,200	799,368	801,537	803,591	805,714	807,774

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:						
	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5
Jefferson	111,452	111,599	111,743	111,953	112,193	112,433	112,653	112,886	113,101	113,318	113,528
Lee	22,590	22,680	22,712	22,751	22,839	22,926	23,015	23,102	23,191	23,281	23,371
Madison	49,744	49,865	50,032	50,149	50,307	50,461	50,610	50,759	50,906	51,051	51,191
Marshall	17,659	17,680	17,716	17,773	17,823	17,873	17,920	17,969	18,017	18,061	18,106
Mobile	70,816	70,851	70,902	71,019	71,100	71,177	71,247	71,318	71,383	71,449	71,508
Montgomery	33,135	33,190	33,229	33,271	33,338	33,403	33,465	33,527	33,588	33,648	33,705
Shelby	36,186	36,274	36,350	36,444	36,559	36,673	36,789	36,900	37,010	37,117	37,226
Tuscaloosa	33,818	33,931	34,034	34,122	34,234	34,346	34,453	34,563	34,669	34,776	34,881

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:											
	9/25	9/26	9/27	9/28	9/30			10/2			10/4					
Jefferson	111,452	111,599	111,743	111,953	112,433	(22,487)	[5,397]	{2,698}	112,886	(22,577)	[5,419]	{2,709}	113,318	(22,664)	[5,439]	{2,720}
Lee	22,590	22,680	22,712	22,751	22,926	(4,585)	[1,100]	{550}	23,102	(4,620)	[1,109]	{554}	23,281	(4,656)	[1,118]	{559}
Madison	49,744	49,865	50,032	50,149	50,461	(10,092)	[2,422]	{1,211}	50,759	(10,152)	[2,436]	{1,218}	51,051	(10,210)	[2,450]	{1,225}
Marshall	17,659	17,680	17,716	17,773	17,873	(3,575)	[858]	{429}	17,969	(3,594)	[862]	{431}	18,061	(3,612)	[867]	{433}
Mobile	70,816	70,851	70,902	71,019	71,177	(14,235)	[3,416]	{1,708}	71,318	(14,264)	[3,423]	{1,712}	71,449	(14,290)	[3,430]	{1,715}
Montgomery	33,135	33,190	33,229	33,271	33,403	(6,681)	[1,603]	{802}	33,527	(6,705)	[1,609]	{805}	33,648	(6,730)	[1,615]	{808}
Shelby	36,186	36,274	36,350	36,444	36,673	(7,335)	[1,760]	{880}	36,900	(7,380)	[1,771]	{886}	37,117	(7,423)	[1,782]	{891}
Tuscaloosa	33,818	33,931	34,034	34,122	34,346	(6,869)	[1,649]	{824}	34,563	(6,913)	[1,659]	{830}	34,776	(6,955)	[1,669]	{835}

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