

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

Date: 9/27/21

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 9/27/21 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.

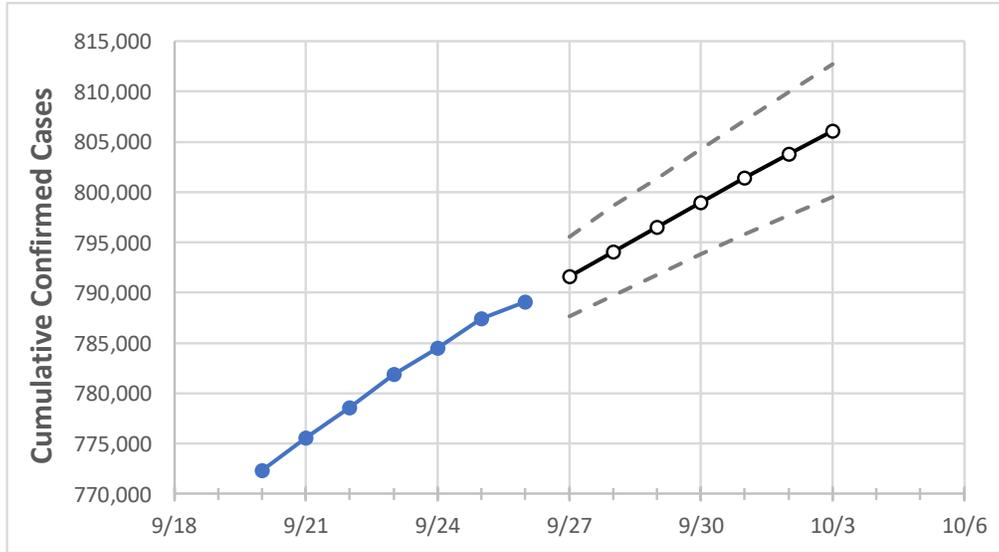
IEM's Modeling Lead

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Alabama	781,915	784,484	787,421	789,054	791,625	794,100	796,544	798,974	801,388	803,778	806,074

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:						
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	10/1	10/2	10/3
Jefferson	110,962	111,169	111,452	111,599	111,865	112,121	112,368	112,616	112,857	113,097	113,322
Lee	22,337	22,407	22,590	22,680	22,782	22,887	22,989	23,094	23,200	23,304	23,408
Madison	49,359	49,549	49,744	49,865	50,038	50,211	50,375	50,543	50,706	50,865	51,025
Marshall	17,575	17,619	17,659	17,680	17,733	17,783	17,838	17,888	17,936	17,991	18,040
Mobile	70,607	70,717	70,816	70,851	70,939	71,018	71,104	71,181	71,255	71,327	71,393
Montgomery	32,996	33,066	33,135	33,190	33,266	33,340	33,412	33,483	33,554	33,622	33,690
Shelby	35,933	36,062	36,186	36,274	36,401	36,525	36,652	36,774	36,898	37,022	37,138
Tuscaloosa	33,540	33,661	33,818	33,931	34,054	34,170	34,285	34,403	34,520	34,633	34,746

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:											
	9/23	9/24	9/25	9/26	9/28			9/30			10/2					
Jefferson	110,962	111,169	111,452	111,599	112,121	(22,424)	[5,382]	{2,691}	112,616	(22,523)	[5,406]	{2,703}	113,097	(22,619)	[5,429]	{2,714}
Lee	22,337	22,407	22,590	22,680	22,887	(4,577)	[1,099]	{549}	23,094	(4,619)	[1,109]	{554}	23,304	(4,661)	[1,119]	{559}
Madison	49,359	49,549	49,744	49,865	50,211	(10,042)	[2,410]	{1,205}	50,543	(10,109)	[2,426]	{1,213}	50,865	(10,173)	[2,442]	{1,221}
Marshall	17,575	17,619	17,659	17,680	17,783	(3,557)	[854]	{427}	17,888	(3,578)	[859]	{429}	17,991	(3,598)	[864]	{432}
Mobile	70,607	70,717	70,816	70,851	71,018	(14,204)	[3,409]	{1,704}	71,181	(14,236)	[3,417]	{1,708}	71,327	(14,265)	[3,424]	{1,712}
Montgomery	32,996	33,066	33,135	33,190	33,340	(6,668)	[1,600]	{800}	33,483	(6,697)	[1,607]	{804}	33,622	(6,724)	[1,614]	{807}
Shelby	35,933	36,062	36,186	36,274	36,525	(7,305)	[1,753]	{877}	36,774	(7,355)	[1,765]	{883}	37,022	(7,404)	[1,777]	{889}
Tuscaloosa	33,540	33,661	33,818	33,931	34,170	(6,834)	[1,640]	{820}	34,403	(6,881)	[1,651]	{826}	34,633	(6,927)	[1,662]	{831}

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.