

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

Date: 10/18/21

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 10/18/21 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.

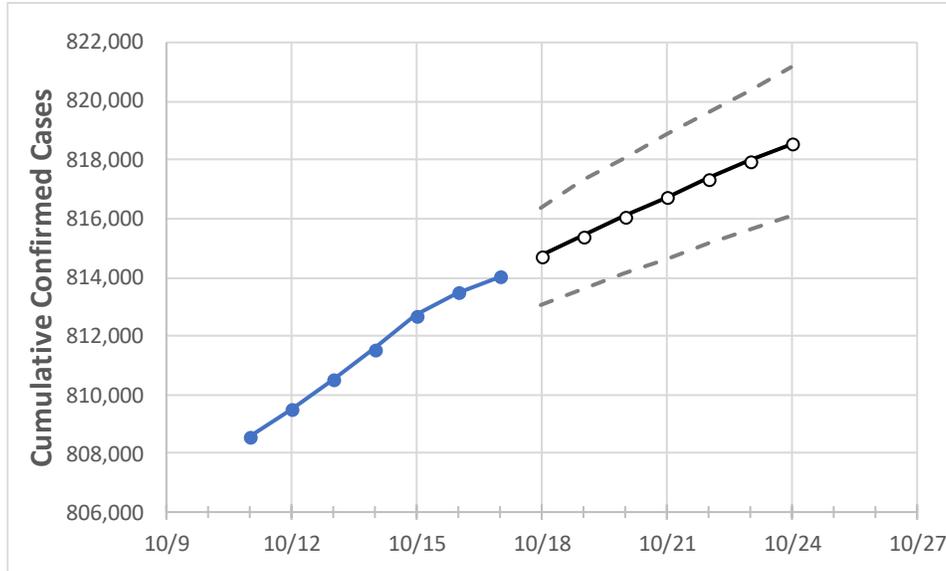
IEM's Modeling Lead

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:					
	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24
Alabama	811,551	812,694	813,481	814,025	814,724	815,412	816,079	816,739	817,369	817,961	818,553

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:						
	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24
Jefferson	113,872	113,960	113,997	114,056	114,112	114,166	114,216	114,262	114,308	114,354	114,397
Lee	23,097	23,122	23,142	23,149	23,162	23,175	23,187	23,200	23,211	23,222	23,233
Madison	51,829	51,923	51,970	52,017	52,066	52,117	52,167	52,212	52,259	52,302	52,346
Marshall	18,224	18,238	18,245	18,254	18,263	18,273	18,280	18,288	18,296	18,304	18,310
Mobile	72,016	72,175	72,227	72,269	72,319	72,372	72,419	72,466	72,514	72,562	72,606
Montgomery	33,879	33,919	33,953	33,971	33,995	34,018	34,041	34,064	34,085	34,106	34,127
Shelby	37,203	37,240	37,279	37,304	37,331	37,357	37,382	37,406	37,429	37,453	37,474
Tuscaloosa	34,853	34,902	34,934	34,966	34,995	35,024	35,051	35,079	35,106	35,131	35,156

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:											
	10/14	10/15	10/16	10/17	10/19			10/21			10/23					
Jefferson	113,872	113,960	113,997	114,056	114,166	(22,833)	{5,480}	{2,740}	114,262	(22,852)	[5,485]	{2,742}	114,354	(22,871)	[5,489]	{2,744}
Lee	23,097	23,122	23,142	23,149	23,175	(4,635)	[1,112]	{556}	23,200	(4,640)	[1,114]	{557}	23,222	(4,644)	[1,115]	{557}
Madison	51,829	51,923	51,970	52,017	52,117	(10,423)	[2,502]	{1,251}	52,212	(10,442)	[2,506]	{1,253}	52,302	(10,460)	[2,511]	{1,255}
Marshall	18,224	18,238	18,245	18,254	18,273	(3,655)	[877]	{439}	18,288	(3,658)	[878]	{439}	18,304	(3,661)	[879]	{439}
Mobile	72,016	72,175	72,227	72,269	72,372	(14,474)	[3,474]	{1,737}	72,466	(14,493)	[3,478]	{1,739}	72,562	(14,512)	[3,483]	{1,741}
Montgomery	33,879	33,919	33,953	33,971	34,018	(6,804)	[1,633]	{816}	34,064	(6,813)	[1,635]	{818}	34,106	(6,821)	[1,637]	{819}
Shelby	37,203	37,240	37,279	37,304	37,357	(7,471)	[1,793]	{897}	37,406	(7,481)	[1,795]	{898}	37,453	(7,491)	[1,798]	{899}
Tuscaloosa	34,853	34,902	34,934	34,966	35,024	(7,005)	[1,681]	{841}	35,079	(7,016)	[1,684]	{842}	35,131	(7,026)	[1,686]	{843}

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.