

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

Date: 5/3/21

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 5/3/21 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.

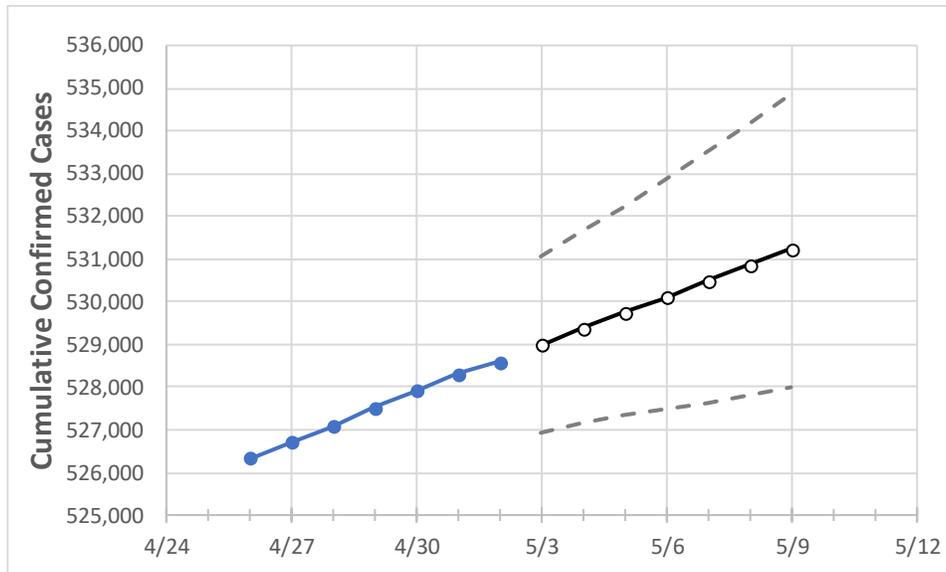
IEM's Modeling Lead

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:							
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	
Alabama	527,513	527,922	528,309	528,597	528,980	529,374	529,749	530,108	530,482	530,853	531,235	

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:							
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	
Jefferson	76,073	76,128	76,175	76,199	76,243	76,288	76,331	76,375	76,418	76,462	76,508	
Lee	15,773	15,784	15,792	15,796	15,806	15,816	15,827	15,837	15,847	15,858	15,868	
Madison	34,452	34,485	34,520	34,555	34,589	34,622	34,657	34,691	34,725	34,761	34,795	
Marshall	12,129	12,147	12,158	12,164	12,176	12,188	12,200	12,212	12,226	12,238	12,252	
Mobile	40,731	40,747	40,767	40,832	40,881	40,932	40,985	41,037	41,091	41,145	41,200	
Montgomery	24,213	24,232	24,249	24,252	24,265	24,277	24,289	24,301	24,314	24,326	24,338	
Shelby	23,318	23,325	23,341	23,350	23,359	23,368	23,377	23,387	23,395	23,404	23,412	
Tuscaloosa	25,577	25,603	25,622	25,633	25,649	25,665	25,681	25,698	25,714	25,730	25,746	

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:											
	4/29	4/30	5/1	5/2	5/4				5/6				5/8			
Jefferson	76,073	76,128	76,175	76,199	76,288	(15,258)	[3,662]	{1,831}	76,375	(15,275)	[3,666]	{1,833}	76,462	(15,292)	[3,670]	{1,835}
Lee	15,773	15,784	15,792	15,796	15,816	(3,163)	[759]	{380}	15,837	(3,167)	[760]	{380}	15,858	(3,172)	[761]	{381}
Madison	34,452	34,485	34,520	34,555	34,622	(6,924)	[1,662]	{831}	34,691	(6,938)	[1,665]	{833}	34,761	(6,952)	[1,669]	{834}
Marshall	12,129	12,147	12,158	12,164	12,188	(2,438)	[585]	{293}	12,212	(2,442)	[586]	{293}	12,238	(2,448)	[587]	{294}
Mobile	40,731	40,747	40,767	40,832	40,932	(8,186)	[1,965]	{982}	41,037	(8,207)	[1,970]	{985}	41,145	(8,229)	[1,975]	{987}
Montgomery	24,213	24,232	24,249	24,252	24,277	(4,855)	[1,165]	{583}	24,301	(4,860)	[1,166]	{583}	24,326	(4,865)	[1,168]	{584}
Shelby	23,318	23,325	23,341	23,350	23,368	(4,674)	[1,122]	{561}	23,387	(4,677)	[1,123]	{561}	23,404	(4,681)	[1,123]	{562}
Tuscaloosa	25,577	25,603	25,622	25,633	25,665	(5,133)	[1,232]	{616}	25,698	(5,140)	[1,233]	{617}	25,730	(5,146)	[1,235]	{618}

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.